PUBLIC WORKS

Feb. 1953

CITY, COUNTY AND STATE

Concrete Saws Make Pavement Cutting Easier

Industrial Wastes—Community-Industry Relations

Utility Finds Air Mapping Better and Faster

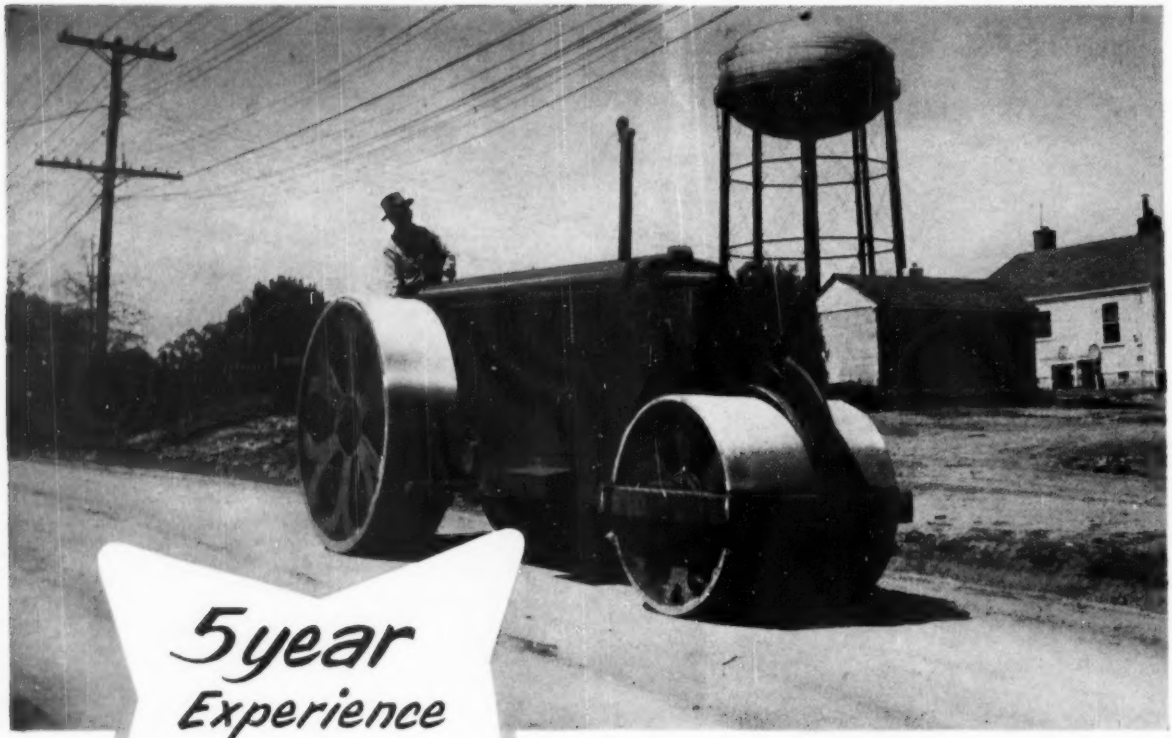
Curing Red Water Problems in Small Communities

What Georgia is Doing in Highway Maintenance

Better Service Eliminates Garbage Gripes

Karl F. Hoefle, superintendent and administrative head of the Dallas Water Works, is shown at the Elm Fork Pumping Station. **More on page 26.**

POWERFUL • ECONOMICAL • EASY TO HANDLE



5 year Experience

with HUBER three-wheel roller leads Charlotte, N. C. to buy another HUBER

HUBER Three-Wheel Rollers are their own best salesmen — a big percentage of owners have come back for their second, third and fourth HUBER machines.

Charlotte, N. C., municipal officials bought their second HUBER on the basis of 5-year experience with their first one.

R. A. Robinson and O. B. Torrence, old hands at the operation of heavy equipment, find HUBER 10-Ton Three-Wheel ideal for their municipal needs. They praise its powerful and economical diesel engine, its year-after-year dependability and its ease of handling.

HUBER Three-Wheel Rollers, available in 8, 10, 12 and 14-ton sizes, are making friends wherever they go. Let your nearest HUBER Distributor tell you and SHOW you the design and construction features that have made them a favorite wherever rollers are used.

HUBER MANUFACTURING CO. • Marion, Ohio, U. S. A.
Manufacturers of Huber Maintainers, Graders and Complete Line of Rollers

HUBER

CHICAGO SEWAGE EQUIPMENT

"PAKAGE" PLANTS

OVER 200 IN OPERATION

Complete data including operating performance charts, specifications, etc., is available upon request.

18 Years of Trouble-Free Performance in small communities, industrial plants and institutions

"Pakage" Plants will handle sewage flows of from 50 to 500,000 gallons per day in single or multiple units. Initial cost is low. Operating costs are nominal.

Because of ingenious automatic features that simplify operations and assure successful performance, "Pakage" Plants can be operated by men without previous sewage plant experience.

Aeration and clarification are performed in a single tank with positive sludge control. One sludge setting covers a wide range of sewage flows and strengths.

"Pakage" Plants produce a sparkling clear effluent, are free from flies, foul odors and unsightly appearances. *They can be located near dwellings if necessary.*

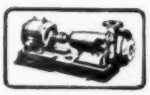
For a sewage disposal unit proved through 18 years of trouble-free performance . . . specify the "Pakage" Plant.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

622 DIVERSEY PARKWAY **CHICAGO 14, ILLINOIS**

Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.



Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

KEEPING ROADS UP AND COSTS DOWN FOR DESHA COUNTY

When a machine's popular both with officials and operators, you can be sure it's doing a job that pleases taxpayers, too. You're looking at one now—a Cat No. 112 Motor Grader, owned by Desha County, Arkansas.

One of the county's officials recently remarked that this No. 112 has proved more reasonable to operate than competitive machines because it's so seldom in the shop. And J. W. Carter says: "I've been an operator for 3 years—on the No. 112 for 1½ years. I like the way the blade controls, the big tires and the way it handles, all over the grader I used to operate."

The No. 112 is shown reconditioning a country road near Pickens. On an 8-mile stretch, it averaged a mile a day ditching and shaping up about a 4″ x 20′ layer of red clay gravel. The No. 112 is also mighty handy reverse blading, scarifying, fine finishing and on other maintenance chores. As J. W. Carter observed, the blade controls easily. For example, without leaving the platform or changing its blade lift or side shift links, you can move the blade from full ditch position to ordinary bank sloping position *in less than a minute.*

All-Caterpillar built, the No. 112's weight, horsepower and speed are *balanced* for smoother operation. Mechanical controls are accurate and dependable. And visibility's excellent. For complete facts, see your Caterpillar Dealer. He's a reliable source of information, service and genuine parts. He'll be glad to give a demonstration—ask to watch the No. 112 at work.

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

FFICERS
W. A. Hardenbergh, *President*
Croxton Morris, *V. Pres. & Treas.*
A. Prescott Folwell, *Secretary*

DITORIAL DEPARTMENT
Editors
A. Prescott Folwell
W. A. Hardenbergh

Managing Editor
Edward B. Rodie

Highway Consultant
George E. Martin

Editorial Assistant
Helen E. Quinn

Columnists
George E. Symons
Leo J. Ritter, Jr.

Art Consultant
Nathaniel Pousette-Dart

BUSINESS DEPARTMENT
General Manager
Croxton Morris

Director, Advertising and Research
Arthur K. Akers

Production Supervisor
I. James Barger

Circulation Supervisor
Edward B. Rodie

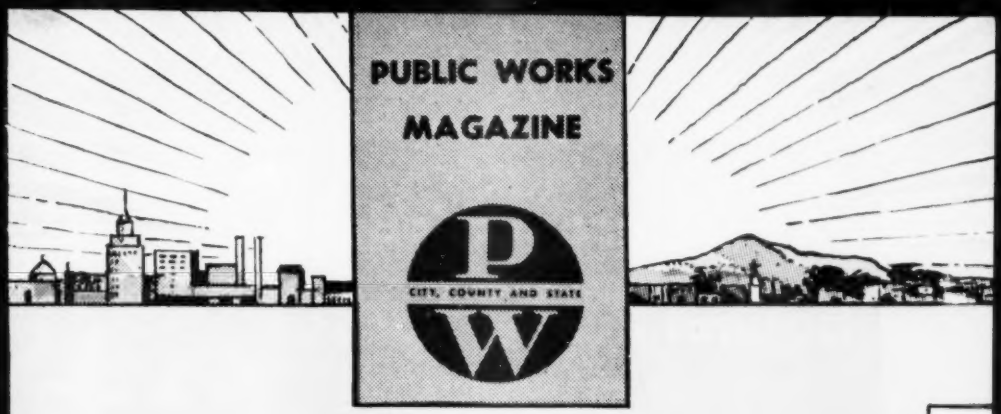
ADVERTISING OFFICES
New York 17, 310 East 45th St.
L. C. Morris, *Eastern Sales Mgr.*

Chicago 11, Ill.
612 N. Michigan Ave.
Robert J. Shea, *Mid-West Sales Mgr.*

Cleveland 10, Ohio, Villa Beach 2, 15445 Lake Shore Blvd.
Burton M. Yost, *District Mgr.*

Los Angeles 14, Calif.
Halliburton Bldg., Suite 318
Simpson-Reilly, Ltd.

San Francisco 3, Calif.
Central Tower, Suite 814
Simpson-Reilly, Ltd.



CONTENTS FOR FEBRUARY, 1953

Cathodic Protection for Deep Well Equipment 46
Costs of Garbage, Rubbish and Ash Collection 46
No More Gripes about Garbage 57
Engineering Data on the Aero-Filter. *By J. A. Montgomery* 58
More Money and New Equipment for Georgia Highways. *C. E. Wright* 60
How to Cure Red Water Troubles. *By Philip S. Davy* 62
Calculating Earthwork Volumes by a Contour Grading Plan 64
Dual Fuel Engines Cut Water Pumping Costs 65
Air Surveys Get Better Maps for a Utility 66
Industrial Wastes—A Community Problem. *By E. B. Besselievre* 68
Why Construction Equipment Should be Kept Clean. *By Ernest W. Fair* 71
Phoenix Averts a Water Famine. *By Dean Smith* 73
Public Relations Program Gets Better Sewerage 74
Reports from the Field—Machines Save Money 78
Saws for Making Concrete Pavement Cuts 81
Practices in Garbage and Refuse Collection and Disposal 88
Cleaning a Water Works Reservoir 104
How to Test for Sea Water Contamination 104
Water Pollution Control in Georgia 111
Mechanical Cleaner for Slow Sand Filter Beds 116
High Rate Water Filtration at Chicago 117

The Sewerage and Refuse Digest 100
The Highway and Airport Digest 107
The Water Works Digest 114

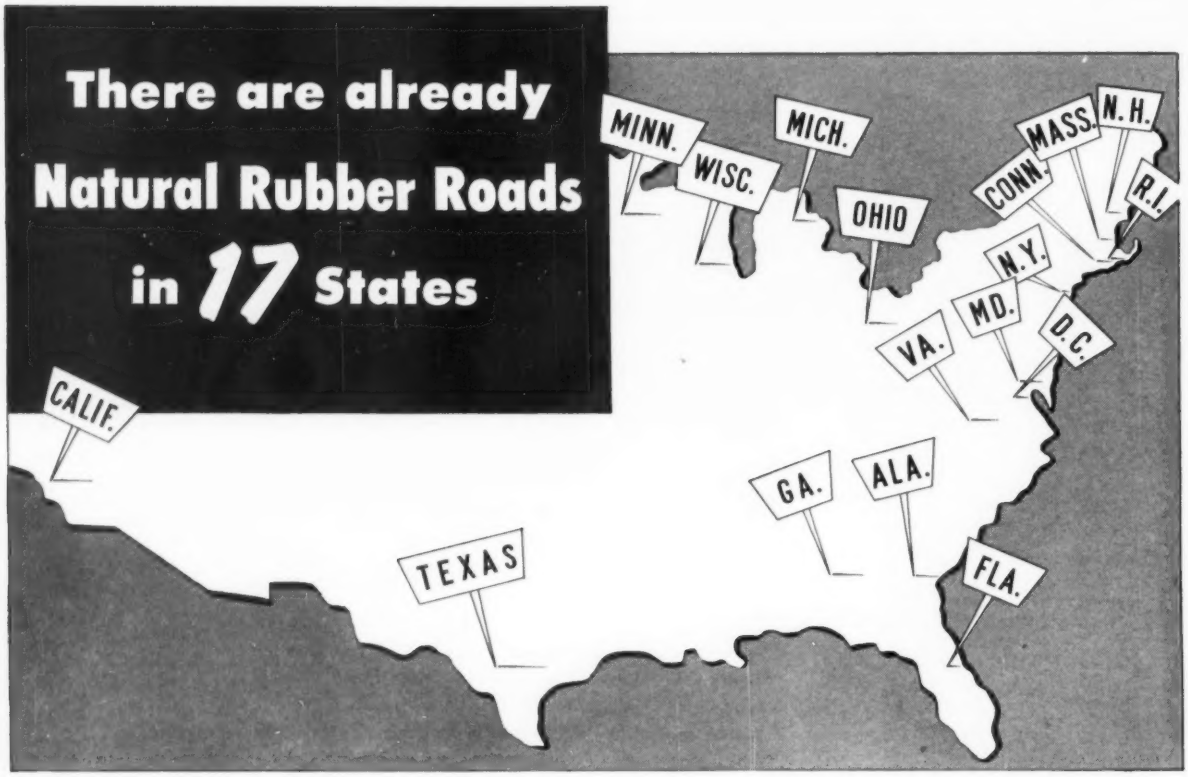
The Editor's Page 7
"Doc" Symons 14
Leo Ritter 18
Letters to The Editor 22
Books in Brief 24
Leaders in Public Works 26
The Engineers' Library 28
Public Works Engineering Data 46
APWA News 81
Washington News Letter 82
New Public Works Equipment 124
Worth Telling. *By A. K. Akers* 130

The 1952 volume of Public Works is available on microfilm through University Microfilm, 313 N. First St., Ann Arbor, Mich.

Published Monthly by Public Works Journal Corporation. Office of Publication at Orange, Conn. Editorial and Advertising offices at 310 East 45th Street, New York 17, N. Y. Subscription rates U.S.A. and possessions, $3.00. All other countries, $4.00. Single copies 50¢ each, except special issues which are $1. Acceptance under Section 34.64 P. L. & R. Authorized.

Copyright 1953 by
PUBLIC WORKS JOURNAL CORP.
310 East 45th St., New York 17, N. Y.

AMERICA'S MOST USEFUL ENGINEERING MAGAZINE



Many More Rubber Roads Planned for 1953

WRITE FOR FREE BOOKLET

Illustrated 36-page booklet, "STRETCHING HIGHWAY DOLLARS WITH RUBBER ROADS," tells the story of test natural rubber roads laid since 1949 in the U. S. and Canada. You may have a free copy by writing to the Natural Rubber Bureau.

☆ ☆ ☆

SEE NEW FILM—A new 30-minute motion picture on rubber roads, describing the work of the Natural Rubber Bureau Research Laboratory and showing rubber road installations in the U. S. Arrangements to obtain the film for a free showing may be made with the Natural Rubber Bureau.

Natural rubber powder, when mixed with asphalt for highway paving, gives promise of providing roads that last longer, require less repair, and help stretch highway dollars.

Highway engineers are enthusiastic over results to date in test roads of natural rubber-asphalt paving. So far, stretches have been laid in 17 states in all sections of the country.

Now is the time for you to plan a road using natural rubber. Suppliers report there will be plenty of natural rubber powder available for road construction in the U. S. this year and orders for any quantity can be filled promptly.

Technical data on laying natural rubber-asphalt paving is offered, without cost or obligation, by the Natural Rubber Bureau. If you are interested in laying a test road with natural rubber, simply write to the Bureau, giving us an idea of the size of the installation and your paving specifications. Our highway engineers will send you the necessary information and answer any questions you may have.

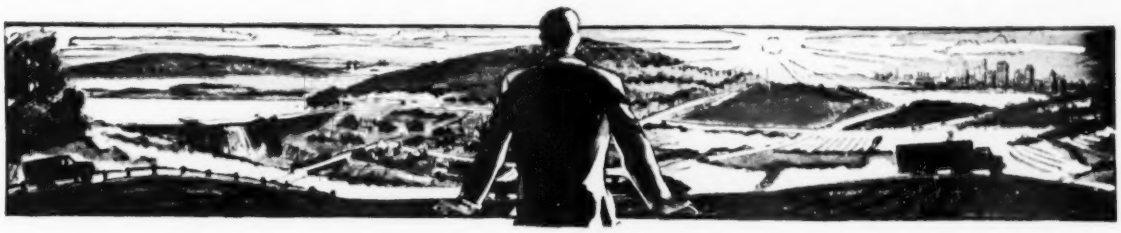
Natural Rubber Bureau

1631 K STREET, N.W., WASHINGTON 6, D.C.

Natural Rubber Bureau Research Laboratory, Rosslyn, Virginia

Get full details of this month's new products . . . mail your Readers' Service card today.

THE EDITOR'S POINT OF VIEW



Vermont Tries to Solve the Problem of Engineer Shortages

IN an effort to compensate for the lack of engineers, due to the current shortage, Vermont's Department of Highways has started a program for training engineering aides. Men with at least one year of high school are given a short special training and are then put into the field to work under supervision. Their status is that of engineering aide.

While applauding the trial that Vermont is making—and wishing them the best of luck—your editor is not entirely sure that the solution is a sound one. First, if it is a matter of substituting inferior skills, that will not solve the problem. In fact, it may create new problems. For instance, unless carefully administered, this program could adversely affect the pay of qualified engineers; it may also affect their professional standing and make other engineers less willing to enter the service of the state. Another question is, what does it offer the trainee and where does he go from here?

There are subprofessional jobs—too many of them—that engineers have been doing and if this program provides for the release of engineers from such work and their utilization at higher levels of engineering usefulness, then we are all for it. But simple justice to these trainees demands that they, too, should have an opportunity to advance in their adopted field of work. Providing such an opportunity, while recognizing that these men are not engineers and cannot do engineering work will be a problem just about as difficult as it will be to get engineers out of subprofessional work, which so many of them appear to love so dearly.

"You-All Come Again"

DRIVING through Roanoke, Va., there is the usual sort of welcome sign as one enters the city. But on the way out, on the back of the welcome sign, which in most cities is blank, were the words "You-All Come Again." These four words were certainly not required by law—but what a nice impression someone's thoughtfulness makes on every motorist who visits Roanoke.

Thoughtfulness in keeping all the signs in your community in good condition and easily readable, and in posting signs where signs should be, is another thing that will be appreciated by all, especially to visitors. Missing street signs may be of little consequence to those who live on the street and know its name. But their lack can be a great annoyance and inconvenience to others trying to find the street. Lack of proper warning signs, or warning signs that have been so neglected that they are difficult to read, represents unnecessary dangers to everyone.

A community with signs missing here and there, where they ought to be, always reminds us of a man with a button off his coat. It bothers everyone else, and it ought to bother him. If a city has the right kind of a sign every place a sign is needed, visitors are much more apt to want to come again, even though there is no such warmly welcoming message on them as Roanoke's, telling all of its visitors "You-all come again."

Congratulations to Our Cities on the Engineering Skills They Have

ONE of the onerous, yet rewarding, duties of the editor is to look more or less thoroughly at the questionnaires returned to this office through the kindness of various groups of its readers. We have recently completed going over some fifteen hundred city engineer questionnaires. We believe that the cities of America are to be congratulated on the skills and abilities of the engineers they employ. Because we believe that what these engineers report is worthy of reading and study by others, we have summarized some of these data in our section "Machines and Men—Reports from the Field."

Reading direct from the reports what these men have done gives us not only a thrill, for it represents everyday engineering at its best, but it assures us that, by and large, our governmental engineering is in fine hands. In these reports also, the equipment salesman will find plenty of new sales arguments, for equipment is often used to advantage for jobs its designer never thought of. Manufacturers will find new ideas for useful equipment accessories and for new devices, and they will find how their equipment is actually being used in the field and on the job. And engineers will find in the doings of their professional brethern much that will benefit them in their own work.

So, we want again to congratulate our cities on the engineering skills they have available.

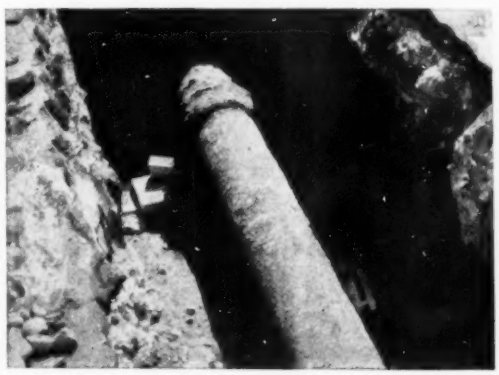
An ounce of proof is

Now's the time to mail this month's Readers' Service card.

worth a pound of claims!

For a permanent installation, such as a new water supply system, or extensions to an existing system, experienced engineers rarely take chances on a substitute for cast iron pipe. They know that 96% of all cast iron pipe, 6-inch and larger, laid in 25 representative cities over the past 130 years, is still in service. On the other hand, it is a fact that more than a few communities have had to replace water distribution systems, constructed with substitute pipe, long before the bonds issued against them were paid for.

The long life and low maintenance cost of cast iron water mains—and the consequent tax savings to the public—are matters of record. An ounce of *proof* is worth a pound of *claims!*



One of a number of cast iron water mains which have been in service in New York City for more than a century. Over 35 other cities have century-old cast iron mains in service.

CAST IRON

CAST IRON PIPE

America's No. 1 Tax Saver

©1952, Cast Iron Pipe Research Association

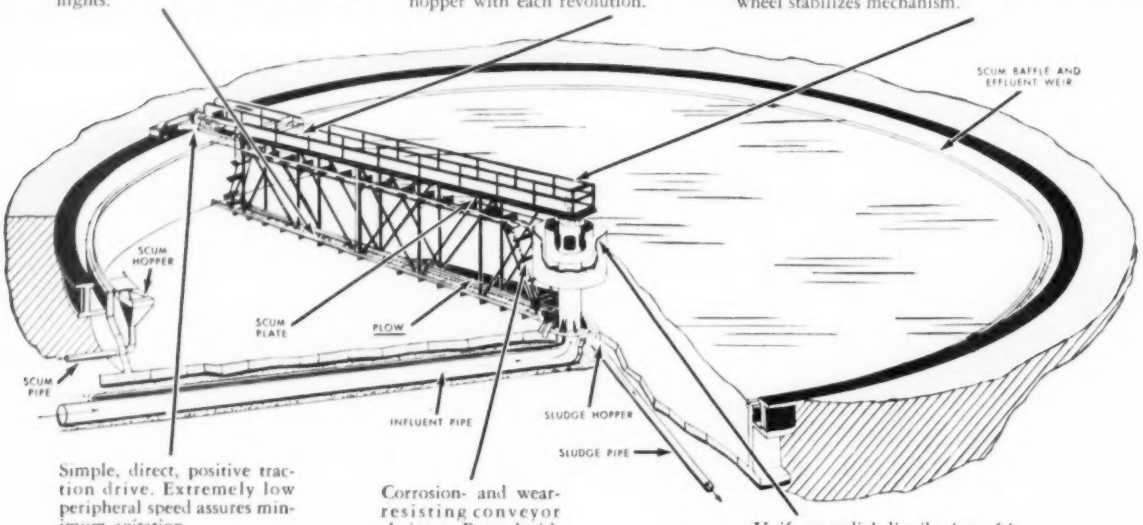
CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

Need more facts about advertised products? Mail your Reader's Service card now.

Settled sludge is collected by a plow with a brass squeegee and carried continuously to the drawoff hopper by the slow-moving conveyor with steel flights.

Floating material is carried to a trap at the outer end of the bridge by the return run of the conveyor and discharged into the scum hopper with each revolution.

Rugged bridge pivots on a large ball bearing. Outer end is mounted on a solid rubber tired traction drive wheel equipped with anti-friction bearings. Forward wheel stabilizes mechanism.



Simple, direct, positive traction drive. Extremely low peripheral speed assures minimum agitation.

Corrosion- and wear-resisting conveyor chains are Promal with a tensile strength of 70,000 lbs./sq. in.

Uniform radial distribution of influent is provided by solid and perforated baffles that dissipate the kinetic energy.

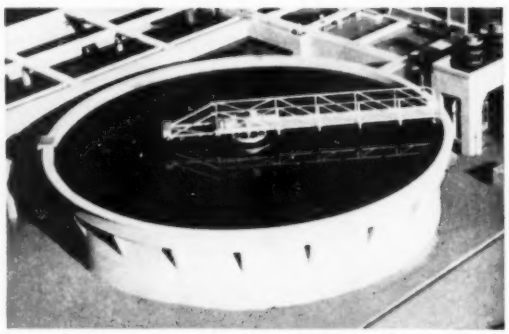
Removes all sludge from tank floor in one revolution

LINK-BELT Circuline Sludge Collector offers efficiency of Straightline Action for round settling tanks

GET quick, positive sludge and scum removal from round settling tanks with Link-Belt Circuline Sludge Collectors. Famous Straightline action provides high efficiency and greater solids concentration.

That's because maximum sludge concentration and complete sludge and scum removal are accomplished—in the shortest time—without septicity . . . without maintaining any sludge blanket.

Circuline Collectors are part of the complete Link-Belt line of quality equipment. Our sanitary engineers will be glad to work with your engineers, chemists and consultants to give you the best in modern water, sewage or industrial liquids treatment equipment.



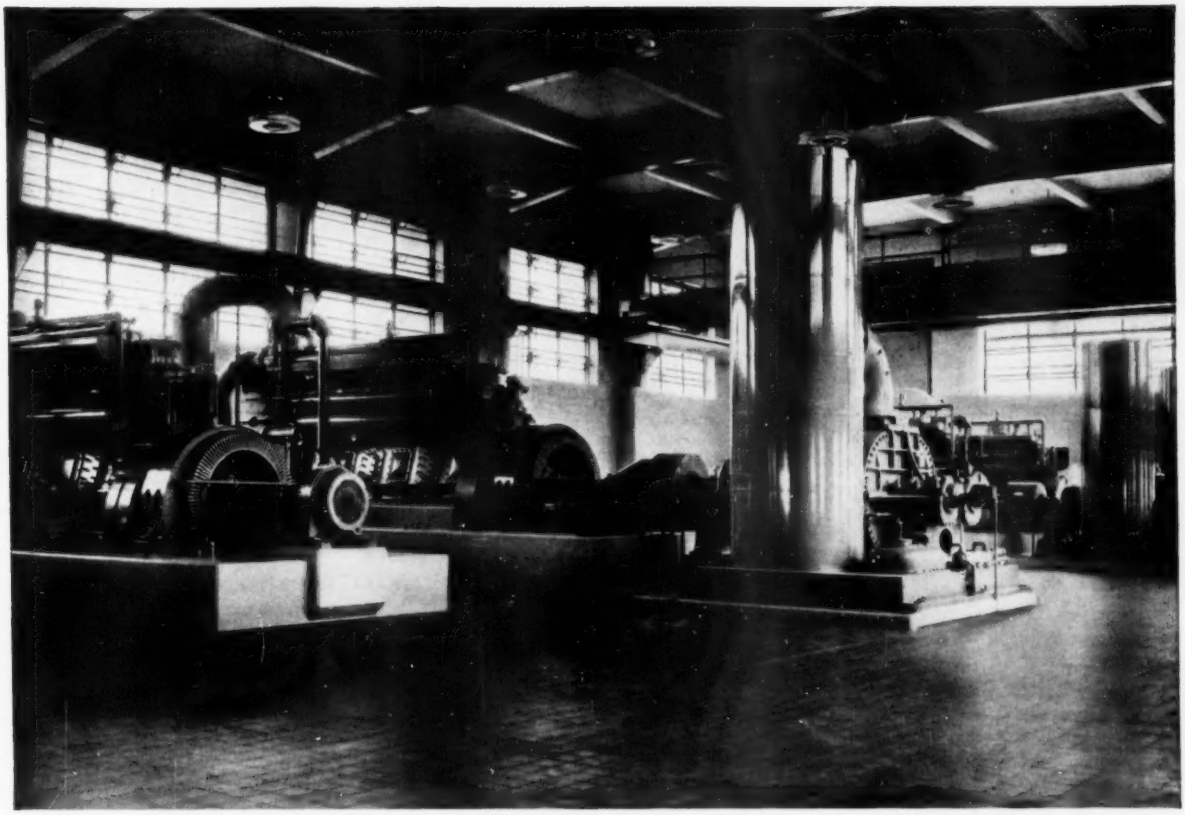
In water, sewage and industrial liquids plants, intermittent operation (usually once or twice per day) assures high efficiency and real economy. In final tanks of activated sludge plants operation is continuous.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,555

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.



DRIVING BLOWERS AND ELECTRIC GENERATORS at Nassau County Sewage Treatment Works at Bay Park, East Rockaway, N. Y., are 5 Worthington super-charged dual fuel engines utilizing sewage sludge gas as a fuel. Engine in center is connected in a combination drive to a 500-kw generator and a 16,112-cfm blower. Consulting engineers: Greeley and Hansen, Chicago, Ill.

How Nassau County Sewage Treatment Works uses sewage sludge gas for economical operation

The newest and the best!

That's everyone's reaction on entering the modern and attractive looking Main Building of the Nassau County Sewage Treatment Works just outside of New York City. It's a first impression that is confirmed by further investigation, for the plant's up-to-the-minute design makes it one of the most efficient in operation anywhere in the country.

As you enter this immaculate, well-planned building, you will note the modern design and rugged construction of the Worthington supercharged dual fuel engines.

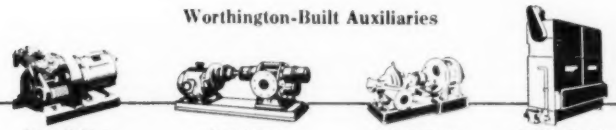
This multi-engine station offers excellent power flexibility to meet the varying load demand since there are two generating units, one combination generator-blower unit and two blower units.

Fuel costs will be at a minimum as these engines will burn sewage sludge gas—a by-product of the sewage treatment process.

If you are interested in obtaining maximum horsepower for the lowest possible cost, investigate these Worthington dual fuel engines. Write for Bulletin S-500-B31C to Worthington Corporation, Engine Division, Buffalo, New York.

E.2.12

Worthington-Built Auxiliaries



ENGINE STARTING COMPRESSORS | OIL TRANSFER PUMPS | COOLING WATER CIRCULATING PUMPS | EVAPORATIVE-TYPE ENGINE WATER COOLERS

Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 150 to 2100 bhp.

WORTHINGTON

Engines

Get full details of this month's new products . . . mail your Readers' Service card today.

For better trickling

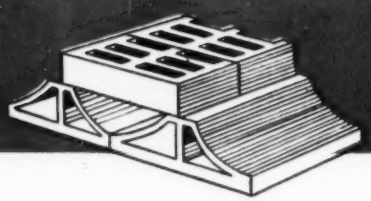
USE TFF INSTITUTE SPECIFICATION UNDERDRAINS

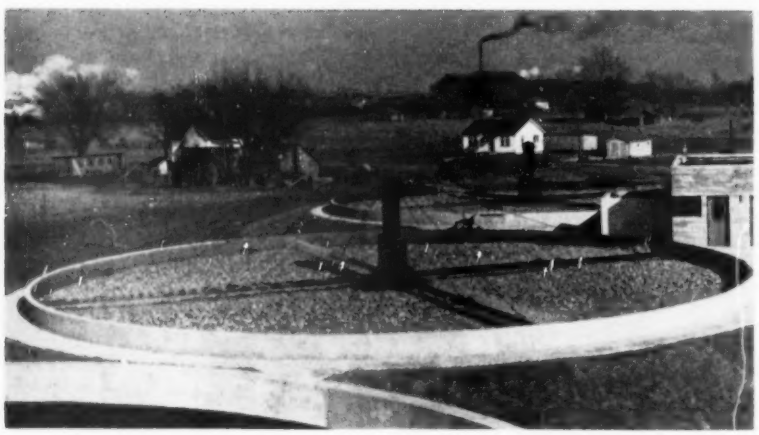
The scientific design of these *vitrified clay filter bottom blocks* insures trouble-free operation for the life of the filter. They have large top openings. That means proper ventilation of all filter media and free discharge of the filter effluent at all times. They have smooth run-off channels. That means quick drainage and no clogging even with years of operation. The blocks are light in weight, self-aligning and easy for unskilled labor to lay. After they have been laid they are strong enough to work on and to support even very deep filter media.

These modern underdrain blocks will carry applications up to 50 MGAD. They are best for all kinds and shapes of filters. They are used everywhere better operating results are desired.

Use them to insure best results from your next trickling filter. Give it a *specification* floor. Use TFFI *vitrified clay filter bottom blocks*. For full engineering details write any member of this Institute today.

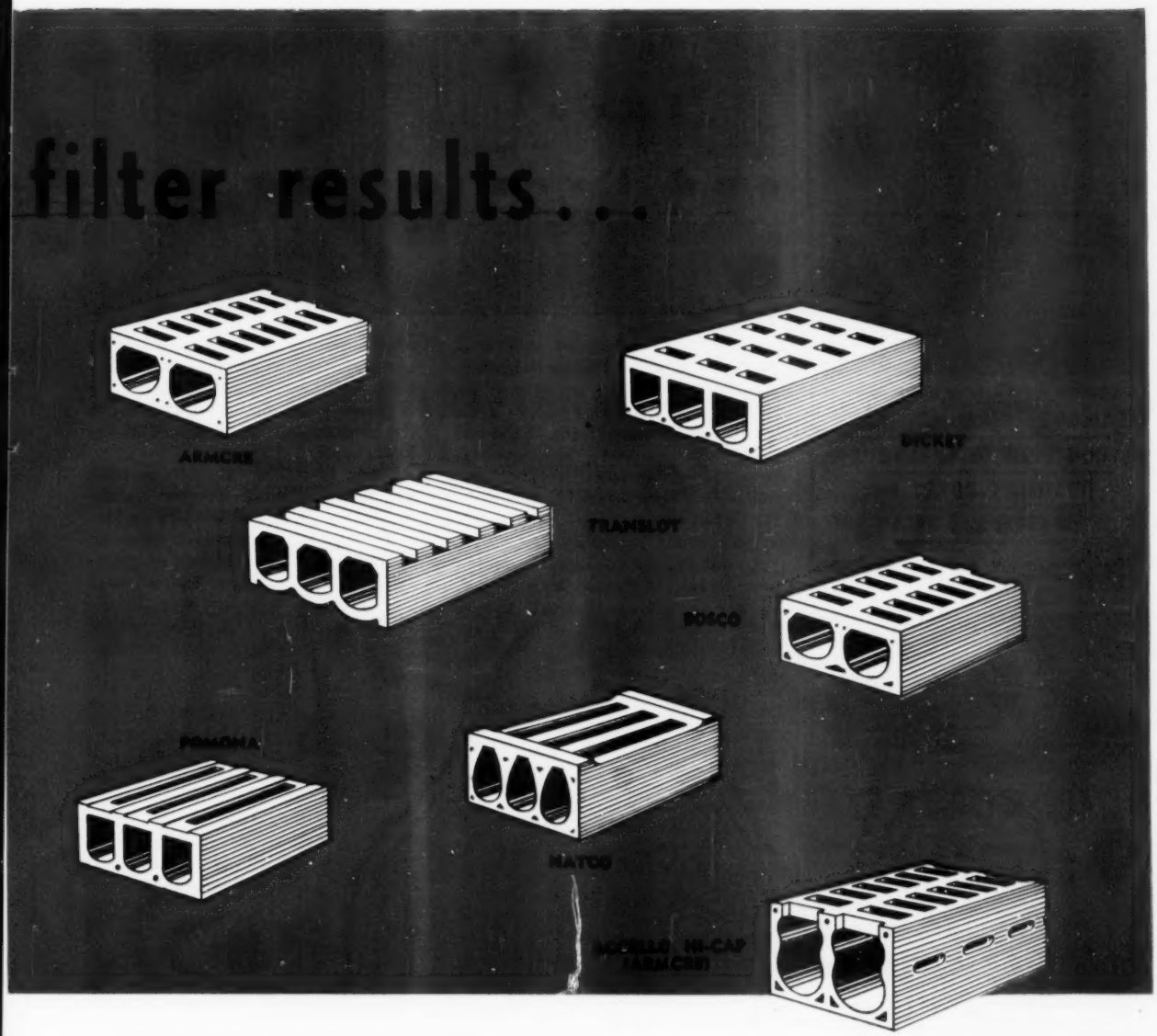
IMCO





Need more facts? Circle No. 20 and mail your Readers' Service card now.

filter results...



Here's the Payoff...

Washington, Ind.: Ten months of operation show the following results: Capacity 1.7 mgd; average sewage flow 0.936 mgd. Raw sewage BOD 61.2; effluent BOD 8.2. Suspended solids, raw sewage, 129 ppm; effluent 16 ppm. Connected population is 11,000. Data from Jesse A. Behle, Sup't., Municipal Utilities, Washington, Ind., and cover 10 months ending Oct. 31, 1952.

TRICKLING FILTER FLOOR INSTITUTE

Ayer-McCarel-Regan Clay Co.
Brazil, Ind.

Bowerston Shale Co.
Bowerston, Ohio

Industrial Materials Co.
Philadelphia 34, Pa.

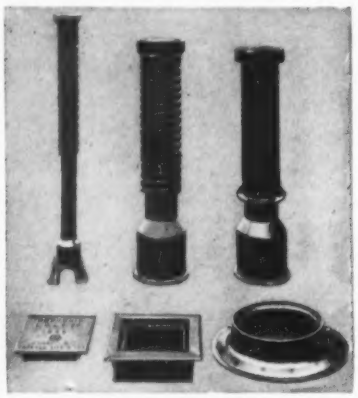
Texas Vitrified Pipe Co.
Mineral Wells, Tex.

Natco Corporation
Pittsburgh 22, Pa.

Pomona Terra-Cotta Co.
Pomona, N. C.

W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.

Need more facts? Circle No. 20 and mail your Readers' Service card now.



Acclaimed for Years of Extra Service!

FAMOUS "Buffalo" CAST IRON SERVICE, VALVE & ROADWAY BOXES for WATER and GAS!

Buffalo boxes are a development of many years of experience in the water and gas field. All new designs are interchangeable with older Buffalo type boxes. Buffalo boxes are heavier, of more rugged construction, which means years of extra service.
Also Manhole Covers and Frames, Square Head Service Boxes, Gas Drip Boxes & Stop Cock Holders.

Write to Dep't H for Bulletin No. 35.

BUFFALO PIPE and FOUNDRY CORP.
Box 33, Station B — DElaware 6764 — Buffalo, N. Y.

DRILL CONCRETE

EASIER! FASTER! BETTER!

RCD Drill Bit for use with rotary electric or air drills

Drills perfect, precision holes even in *reinforced* concrete. Super fast and easy (6" deep hole in 1 minute!) Pays for itself in time-savings. Made to last.

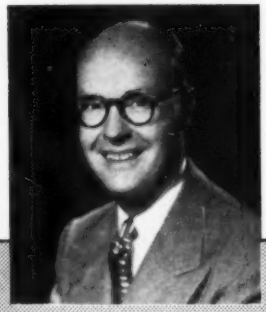
Widely used for the past five years by most of the largest U. S. corporations, manufacturers, and utilities, as well as thousands of smaller firms, installation men, contractors, electricians, plumbers, etc. Superior concrete drilling **plus longer drill bit life due to FREE factory re-sharpening service** keeps them sold.

Personalized guarantee given to every RCD Drill Bit user
If dealer cannot supply (or service), buy direct.

Send for illustrated literature and price list

ROTARY CONCRETE DRILL CO.
650 S. Arroyo Parkway, Pasadena 1, Calif.

People, Ideas and Events



BY "DOC" SYMONS

H. T. M. A. — And as you read this column, sometime in February, remember that it was written on the last day of 1952 when, like Janus, I looked backward at the old year—with mixed feelings—and forward to the new—with hope—and best wishes for all my friends.

★ ★ ★

A most unique Christmas greeting came to me, % Public Works, from H. Vance (Clean Waters) Crawford, retired Appl. Engr. of Gen. Elect. Co. The card showed scenes from more than 20 lands he and Mrs. Crawford had visited on their trip around the world, with season's greetings in as many languages.

★ ★ ★

Festschrift — A Feast of Words—At the annual dinner of the San. Engr. Sect. of APHA in Cleveland in October, W&T's "Bill" Orchard, long-time M.C. of the group, was presented with a bound volume of photographs and letters from more than a hundred friends. Came as a complete surprise. I'll bet a goodly portion of those letters were not half as expressive as the personally penned card of thanks which "Bill" wrote to each of the contributors to the "Festschrift."

★ ★ ★

Oops—Sorry! — In the Dec. issue of this column, I told the story of Mrs. Dwight Bender, "wife of Asst. Supt. of Sewage Treatment, Indianapolis, Ind." and how she won $30 at a radio quiz show while attending the 25th Anniversary Meeting of FSIWA.

There was one slight error in that story—She is the wife of the Superintendent of Sew. Treat., Indianapolis, Ind.—a title he has had for some months now.

★ ★ ★

Names Make News —"Willem Rudolfs Retires"—So read the headline of a story that told how he had completed 33 years of accomplishment at Rutgers Univ. Twenty-five of those years have been active in the growth and development of the Federation.

I first met "Doc" Rudolfs in 1925, when I was a cub chemist in the laboratory of "Doc" Hatfield in Decatur, Ill. We exchanged ideas on sludge digestion feeding experiments.—A few years ago when I worked with "Pete" Wisely on the 20-year Index of Sewage Works Jour., I found that Rudolf's name appeared as author or co-author of 69 articles (not counting the annual Research Committee Report) and runner up was Dr. Heukelekian with 59 items. And everyone knows that "Heuk" was Rudolfs' right hand man.—Without the N. J. Agr. Expt. Sta. studies under Rudolfs, the issues of the Federation Journal would have been slim indeed.—Good luck, "Doc", in your retirement.

★ ★ ★

Sign over my son's college roommate's desk—

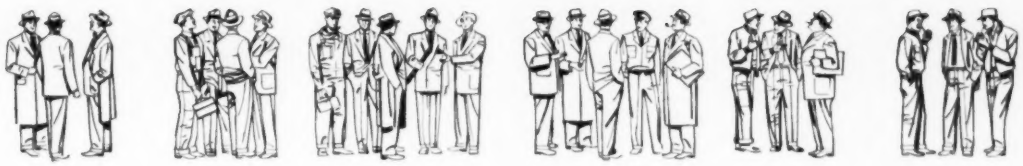
No fame I crave; before my eye,
A single goal I keep—
I hope just once before I die,
To get sufficient sleep.

Incidentally, Charlie Capen, AWWA Prexy, and Cornell Alumnus visited the campus not long ago and called our son Jimmy; reminded him of the AWWA meeting in Atlantic City, N. J. in '48, when Jim was busy taking pictures for me. Seems like only day before yesterday.

★ ★ ★

Swedefinitions —I collect daffy definitions, which I call Swedefinitions in honor of one C. C. (Swede) Larson, (who is Supt. of Filtration, Springfield, Ill. Dept. of Water, and Chemist, Springfield, Ill., San. Dist.), because he is noted for his own collection, many of which can't be published.

(*Continued on page* 120)



Plant Operators are all talking about the Low Maintenance Costs

with

DORR CLARIFIERS

And the talk is based on *fact* . . . actual studies of Dorr Clarifiers in operation over a period of years.

For example, look at Cleveland, Ohio's Easterly Treatment Plant — where sixteen 112′ dia. Dorr Clarifiers have been in operation since 1932. The figures below are based on actual and accurate plant records — and they're typical of the kind of repair costs you can expect with Dorr units.

Repair costs are one of the primary factors upon which Clarifier excellence should be judged. Are you getting the best?

We'd like to tell you how Dorr Clarifiers stack up on performance too. Ask a Dorr Engineer for the facts.

16 Dorr Sifeed*Clarifiers, for handling 123 M.G.D. of activated sludge at Easterly Treatment Plant, Cleveland, Ohio.

*Reg. U.S. Pat. Off.

13-Year Repair Cost Record for 16 DORR Clarifiers

Years of Operation	13
Total Repair Cost	$848.83
Repair Cost *per unit*	$ 53.05
Repair Cost, per unit, *per year*	$ 4.08
% of Original Cost spent for all repairs in 13 years	0.6%

Better tools TODAY to meet tomorrow's demand

DORR

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.

Offices, Associated Companies or Representatives in principal cities of the world.

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Spokane Highway Department Loading Gravel with a "QUICK-WAY"

"QUICK-WAY"

Reg. U.S. Pat. Off.

WORKS *more jobs*
SAVES *more time*
SAVES *more money*
for Cities, Counties and States

"QUICK-WAY", the original truck shovel and still the leader, has for 30 years been a vital tool in saving money and speeding work for Cities, Counties and States.

A "QUICK-WAY" is a versatile piece of equipment that **fills a vital need** on most every type of public works project—handles so many different jobs, such as moving gravel and rock, laying or loading pipe, ditching, backfilling, repairing gas lines, handling materials, etc., with speed and efficiency and at lower operating and maintenance costs.

The "QUICK-WAY" is especially built for mounting on standard trucks, features low center of gravity, works easily over the side, gives easy, fast swinging, has plenty of reserve power, rugged all steel construction and numerous parts interchangeable for easy maintenance.

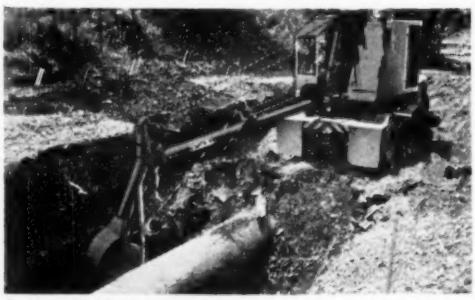
Denver Municipal Water Department "QUICK-WAY" Laying Pipe

Fully convertible in minutes—an attachment for every job, trench hoe, backfiller, crane, shovel, clamshell, pile driver, dragline. 4 Models—¼ to ½ yard—3 to 10 ton crane capacity. Economical to buy. Send coupon today for full details.

"QUICK-WAY"
TRUCK SHOVEL CO.
Denver, Colorado, U. S. A.

Michigan Consolidated Gas Company "QUICK-WAY" Unloading Pipe

Oregon Highway Department "QUICK-WAY" Digging a Drainage Well



Southern California Gas Company "QUICK-WAY" Repairing Gas Line

Mail Coupon Today

"QUICK-WAY" TRUCK SHOVEL CO.
Dept. 118 • 2401 East 40th Ave. • Denver, Colorado • U.S.A

Please send me complete details on "QUICK-WAY" Truck Shovels—four different models for large jobs and small.

Name_____

Address_____

City_____ State_____

Get full details of this month's new products . . . mail your Readers' Service card today.

LOAD-PACKER loads and compacts ALL refuse

Wooden crates, discarded furniture, worn out tires—even rolled-up rugs and mattresses—these powerful new Gar Wood Load-Packers load and compact anything that can be placed in the deep, oversize hopper. This distinctive Load-Packer feature means faster, more economical *and more complete* refuse collection on every trip. There's no need to send an extra truck to pick up refuse too bulky for conventional loaders . . . there are no costly delays while crew breaks up boxes, crushes big cans and drums or smashes discarded household effects. Load-Packer's powerful hydraulic pressure *compresses and compacts all refuse* into a solid mass within the body.

Big, wide-opening side doors, too, are standard equipment on all Gar Wood Load-Packers. Refuse too bulky or too long for even the big Load-Packer hopper can be loaded through these convenient doors. Thus selective loading is eliminated—nothing is left for householders to dispose of themselves. Complaints are reduced and service and public relations improved.

You can do a real service for your tax-payers by putting Gar Wood Load-Packers to work in your community. Join the thousands of other cities, towns and villages that depend on Gar Wood Load-Packers for fast, efficient, economical refuse collection. Get the Load-Packer story *today!*

CHECK THESE LOAD-PACKER EXTRAS:

- Larger capacity, tapered body
- Lower, wider loading hopper
- Fully-automatic finger-tip control
- Streamlined, leakproof design
- Improved hydraulic dumping
- Lower maintenance costs

Customer Service Dept. 3B122
Gar Wood Industries, Inc.
36015 Main St., Wayne, Mich.

Please send me the Load-Packer story on faster, more efficient refuse collection.

Name and Title_____

Address_____

City_____ Zone____ State_____

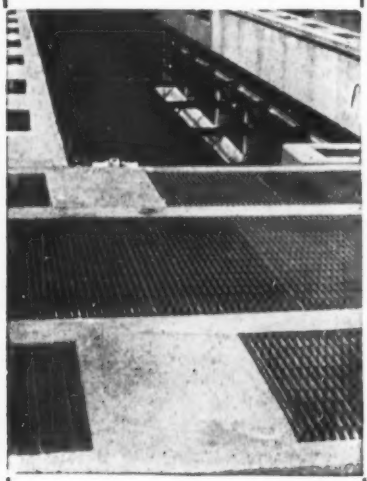
GAR WOOD GW INDUSTRIES

GAR WOOD INDUSTRIES, INC.

WAYNE, MICHIGAN

TRUCK EQUIPMENT: Dump Truck Bodies and Hoists, Winches and Cranes, Pole Derricks, Refuse Collection Bodies, Elevating End-Gates.
CONSTRUCTION EQUIPMENT: Excavators, Scrapers, Dozers, Ditchers, Spreaders, Finegraders, Truck-Mounted Road Graders.

WALK...
DRY!
SAFE!
CLEAN!
ON
IRVING
"DRYWAY"
GRATING
WALKWAYS and
STAIR TREADS



IRVING GRATING
Provides the perfect Dry, Clean, Safe flooring for Sewerage disposal Plants. Gratings of Aluminum, Steel and other alloys offer a minimum of Maintenance Cost.

Catalog Mailed on Request.

IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902

OFFICE and PLANTS at
5053 27th St., Long Island City 1, N. Y.
1853 10th St., Oakland 20, California

UP FRONT FOR ADEQUATE ROADS

BY
LEO J. RITTER, JR.
New York University

Orchids To: Ben H. Petty, Professor of Highway Engineering, Purdue University, Lafayette, Indiana, for his continued efforts in behalf of highway engineering education and highway engineers in general. Long noted for his leadership in the annual Purdue Road School and his close association with county road problems in Indiana, Professor Petty is currently serving as president of the Educational Division of the American Road Builders' Association. A man of tremendous energy, his monthly "Highway Extension News" published at Purdue, makes interesting and valuable reading for anyone in the highway field. He's a wonderful after-dinner speaker, too.

Roy E. Jorgensen, Engineering Counsel of the National Highway Users' Conference in Washington, D. C., for his sound thinking and realistic approach to problems of highway planning and economics. His "Priorities and the Development of Annual Highway Programs" is high on the list of recommended reading for highway officials and engineers.

H. A. Radzikowski, Chief of Maintenance of the U. S. Bureau of Public Roads, for his tireless work in behalf of modern mechanized road and street maintenance in this country.

Route Markers: An idea which is not new but which we wish more people would adopt is the system of using distinctive colors (and shapes) for markers which designate major rural routes through cities. It's a lot easier to find and follow a bright color than to separate out the number you are trying to find from among several, particularly when you are completely unfamiliar with the details of the route you are traveling. Another wish—that some one would devise a way more simply to direct strangers to the correct place at critical points of major congestion, like the New York end of the Holland Tunnel, so that country boys like me could get into the correct lane in time to make the necessary turns.

Incidentally, has anyone come up with a good way of keeping highway signs from becoming coated with snow? We completely missed one of the approaches to the New Jersey Turnpike during the New Year's Eve storm because of this—as we later verified, the sign was there—it was large, easy to read *and* a distinctive color, but all this was to no avail because it was completely coated on the side facing us with wet snow. Anybody got a good idea we can pass on?

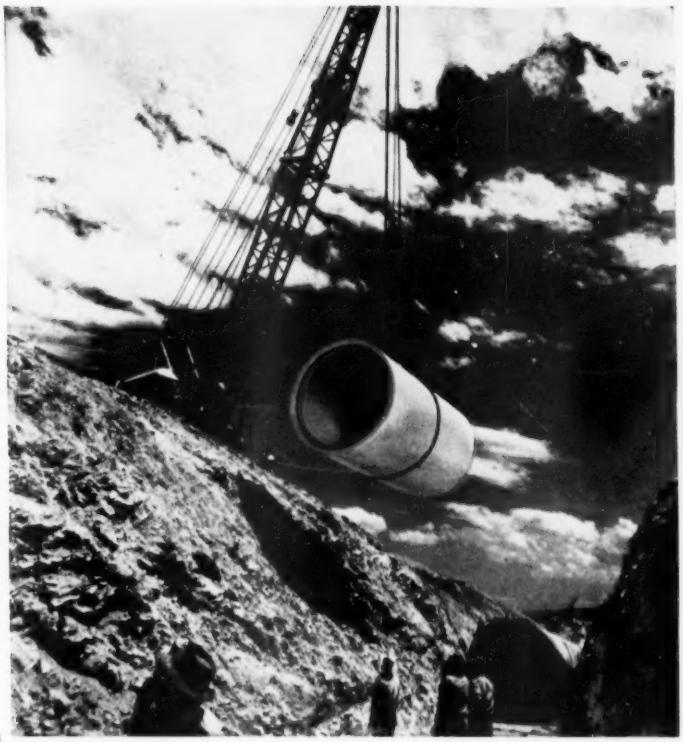
Something Good: A very effective presentation of the whys and wherefores of the traffic problem facing one of our major cities, together with preliminary suggestions for solution of the problem, is the "General Street Plan" for the City of Denver. This report was prepared by the Denver Planning Office under the direction of W. F. Henninger, Director. Maybe some of the art work is not all that might be desired but in general the graphical presentations are extremely attractive and effective in clearly illustrating the various phases of the problem and the necessity in providing for a solution *now*.

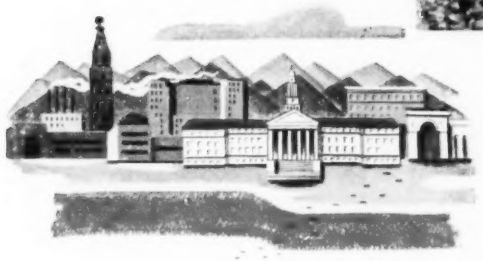
Back To School: This is the time of year when a number of engineering colleges, usually in close cooperation with their state highway departments and other agencies, stage their annual road schools, highway conferences, and similar get-togethers.

Some of these affairs, like those sponsored by the University of Michigan, Purdue University, Texas A & M, the University of Illinois, and others, have been in operation

(*Continued on page* 118)

Denver Prefers Concrete Pressure Pipe





Thirty-two years ago the city of Denver installed its first concrete pressure pipe. From time to time, as the demands for water increased, Denver has added to its water transmission system . . . and the pipe selected most has been concrete pressure pipe.

Denver engineers give these reasons for this preference: (1) the permanent high carrying capacity of concrete pipe, (2) the immunity to blow-out or rupture, (3) proof against tuberculation, corrosion, and electrolytic damage, (4) extremely long life and maintenance economy.

The performance in Denver and in other cities, both large and small, throughout the country proves the distinct advantages offered by concrete pressure pipe. Let us show you how these same advantages can be used for the water system in your community.

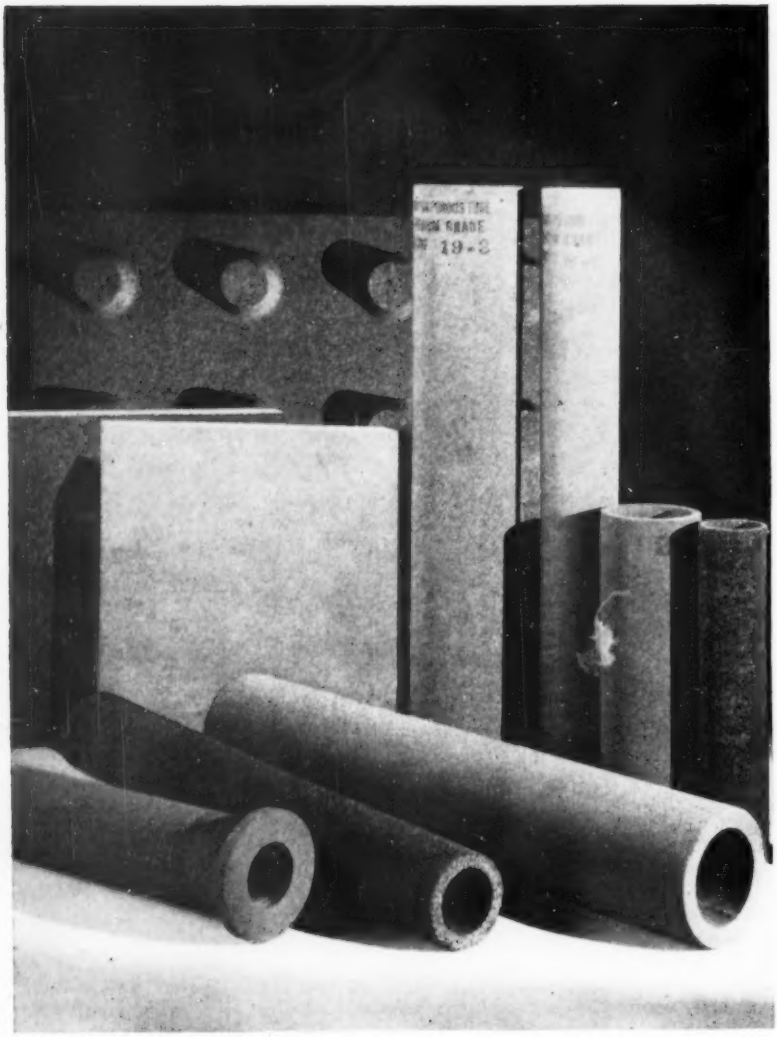
Engineering Assistance . . . our staff of trained engineers will be happy to help you with any water storage or transmission problem. This service is offered you at no obligation. Write Mr. H. F. Peckworth, Managing Director, American Concrete Pressure Pipe Association.

Water for Generations to come

Concrete PRESSURE Pipe

AMERICAN CONCRETE PRESSURE PIPE ASSOCIATION
228 North LaSalle Street
Chicago 1, Illinois

Need more facts about advertised products? Mail your Reader's Service card now.



NORTON ALUNDUM* POROUS MEDIUMS are available in a wide range of sizes in the form of plates, tubes and discs. Plates in the rapid sand filters for water filtration, plates and tubes for aeration in activated sludge treatment plants, seamless tubes in diatomite filters for filtration in municipal swimming pools.

No other porous mediums make uniform flow *so certain*

Only Norton ALUNDUM porous mediums are made with the patented Norton "controlled structure" process. That's why you'll value Norton ALUNDUM porous plates and seamless tubes beyond all others. No other porous mediums have such uniformly distributed pores in the right size and open-pore ratio.

OTHER VALUABLE PROPERTIES

Norton ALUNDUM porous mediums are relatively unaffected by the acid and alkaline conditions normally encountered in aerating and filtering applications. Their great strength and extreme resistance to abrasion give them extra long life. Their resistance to properly applied temperatures up to 1800 F permits you to burn off organic matter if pores become clogged. The seamless feature of ALUNDUM tubes assures uniform cleaning in backwashing.

WRITE FOR INFORMATIVE BULLETINS

Illustrated bulletins full of facts, charts, and tables tell you all you need to know about Norton porous mediums. They're yours for the asking. Write us direct. NORTON COMPANY, 221 New Bond Street, Worcester 6, Mass. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

NORTON

POROUS MEDIUMS

Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASSACHUSETTS

Now's the time to mail this month's Readers' Service card.

Progress in Motor Grader Design

Allis-Chalmers new AD-40 shows importance of visibility. Operator can see front wheels — both ends of blade while he works.

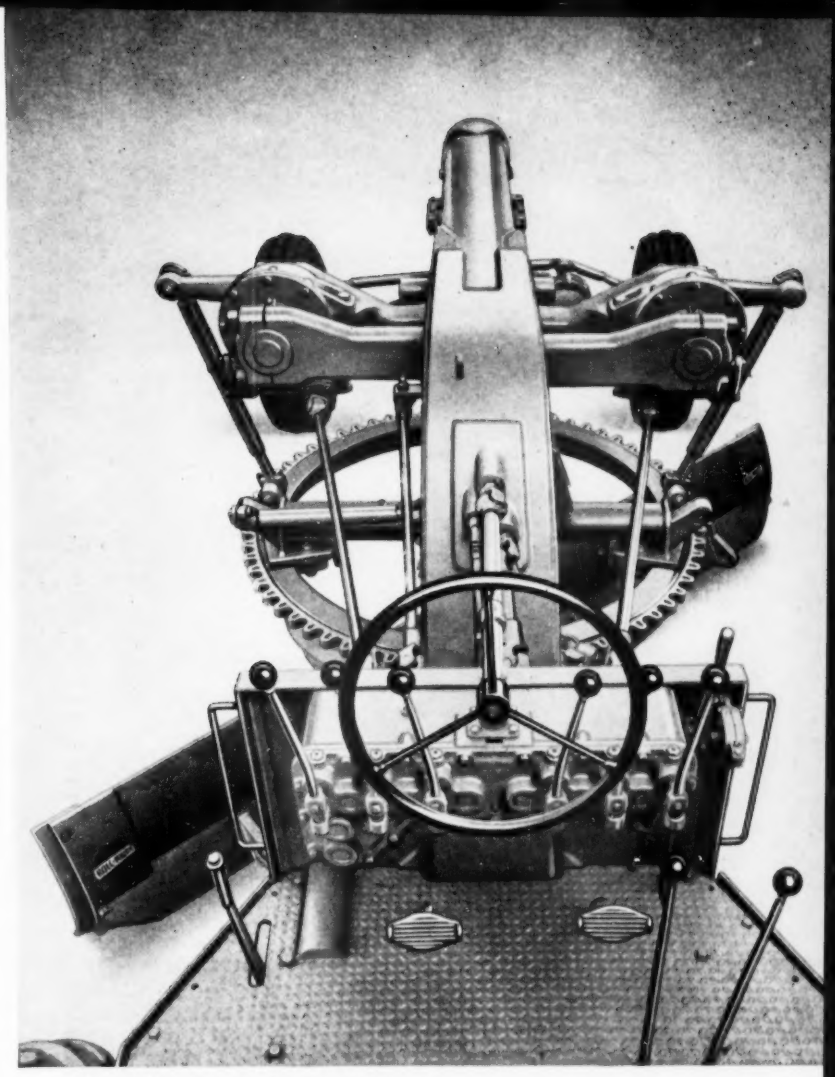
A MOTOR grader operator has to be able to *see* his work to do a good job, whether he's rolling big windrows or doing highly accurate finishing.

Here is how Allis-Chalmers engineers made sure the new AD-40 met these requirements. They carried A-C's single member frame all the way from the front axle to the platform; cut down the size of the lift cases to eliminate blind spots; lowered the control box and eliminated assemblies from the front panel to provide better visibility of the work area directly in front of the operator; tapered the front edges of the platform so that he could see both ends of the moldboard as he works.

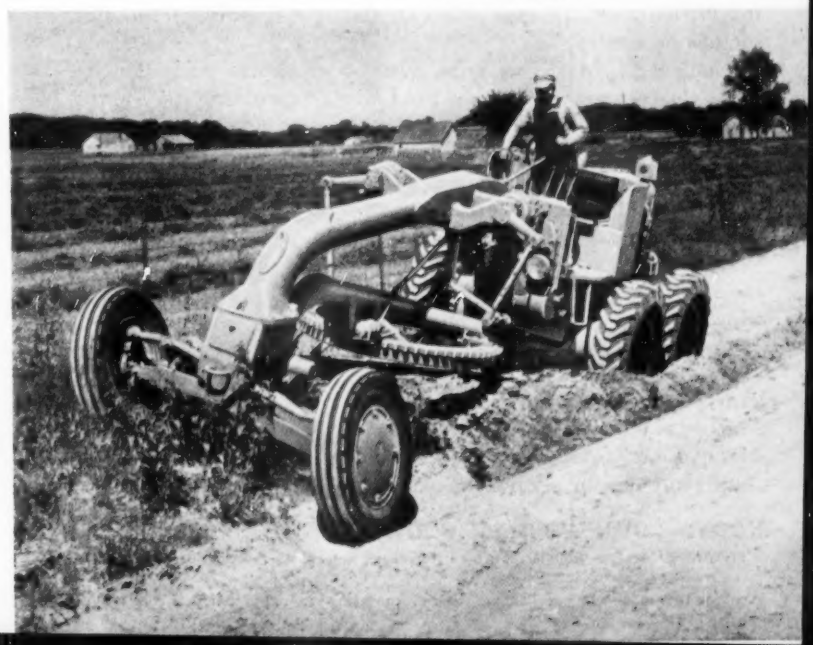
A-C fieldmen also knew that a grader operator likes to sit down whenever the job permits. So they've not only given him ample leg room for stand-up operation but also a steering wheel of adjustable height and a seat that rolls forward at a touch for sit-down operation.

Combined with a new kind of power steering, these advanced design features are making Allis-Chalmers AD-40 an increasing favorite with operators and owners alike because it means more work done with less effort. For more facts on the AD-40, it will pay you to see your nearby Allis-Chalmers dealer soon.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



(above) Here is actual view operator has from platform of Allis-Chalmers AD-40, showing how well he can see both ends of the blade and both front wheels.



(below) The AD-40 has 104 brake horsepower, 23,000 pounds of weight and tandem drive traction, all it needs to do a better job on heavy duty construction . . . a faster job on maintenance.

Rotary Positive Gas Pumps
5 cfm to 50,000 cfm.
CENTRIFUGAL BLOWERS AND EXHAUSTERS
single and multi-stage units, in capacities from 2,000 cfm to 100,000 cfm or higher, at maximum practical pressures.
Rotary Positive Blowers and Exhausters
5 cfm to 50,000 cfm.
Positive Displacement Meters
4,000 cfh to 1,000,000 cfh.
Cycloidal Vacuum Pumps
500 cfm to 13,000 cfm.
Inert Gas Generators
1,000 cfh to 35,000 cfh.

WE *Specialize* IN YOUR PROBLEMS OF MOVING GAS OR AIR!

You may need to move a thimbleful of gas . . . or create a cyclone of whirling air. Whatever your problem, we've probably met something close to it, in experience of almost a century of building such equipment.

Another reason why we know so much about this job is that it's all we do. Our customers range from the "giants of industry" to the neighborhood plant, both of whose production depends upon continuous, reliable, economical performance of air and gas handling units. Because we build the exclusive *dual-ability* line of Rotary Positive and Centrifugal Units, in a wide range of sizes, we offer a *dual choice* which permits completely unbiased recommendations.

So—if you have a problem today—or anticipate one a year or five years from now, we suggest you call upon the facilities of R-C Specialists. Write for bulletins on any specific equipment.

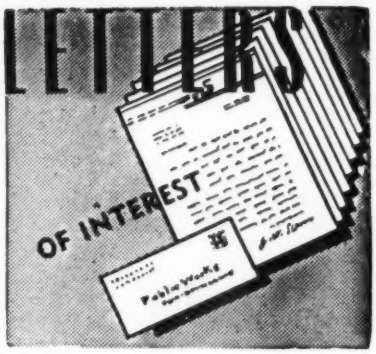
ROOTS-CONNERSVILLE

Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC • 253 Poplar Ave. • Connersville, Indiana

Thousands use our Readers' Service card to keep up to date . . . do you?



GREETINGS FROM AN OLD FRIEND

After some 31 years of service with the City of Topeka, I retired from the post of City Engineer a year ago. Since then I have been without my old friend on my desk. Therefore, it is with no meagre happiness that I am now in receipt of your announcement that I am to receive your magazine through your cooperation with the American Public Works Association—of which I am a life member, having also been a member of the predecessor American Society of Municipal Engineers.

I found your magazine particularly useful in respect to city engineer problems; and I find, too, that there are more clippings from it in my files than there are from any other engineering magazine. More power to you as the years go by.

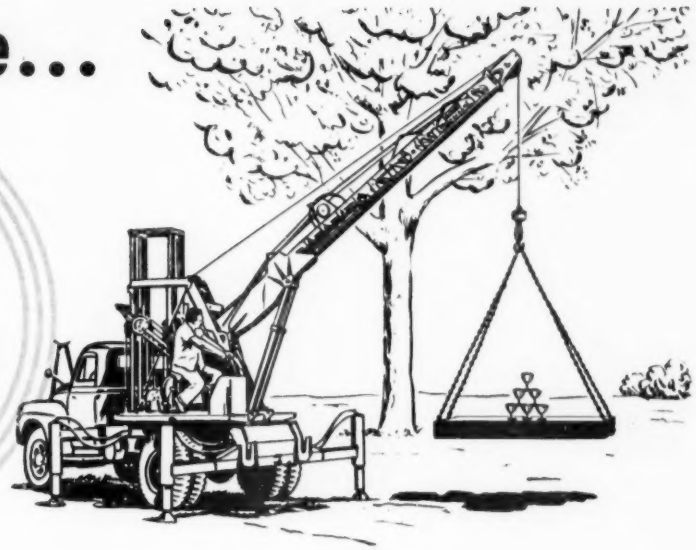
W. E. Baldry,
Consulting Municipal Engineer,
Topeka, Kansas.

GOLD IS TOO CHEAP

Our community has been hard hit because of inability to work our gold mines profitably as long as gold remains at $35 an ounce. Right now the logging and lumber industry is keeping us going. Last winter we had 42 inches of snow to contend with and snow removal is hard on streets—and our street funds are limited.

We now have a city manager, H. J. Ray, a retired admiral. The city's principal revenue comes from the sale of water to some 900 consumers, who now pay $2.50 per month for all the water they want to use. Even during December, when irrigation isn't necessary, average consumption is 232 gpcd. We now pay 43 cents a miner's inch (one and a half cubic feet per minute) for our water, which formerly cost 16 cents.

Smooth and Sure... that's Hydrocrane PRECISION CONTROL



No matter how carefully you must handle certain materials — street lamp posts, clay pipe, power line transformers, valves, hydrants — you can handle them with confidence the smooth, safe Hydrocrane way. With every crane function actuated by a liquid-smooth, cushion-action hydraulic system, Hydrocrane control is so precise loads can be moved a fraction of an inch if necessary. In actual tests, this machine lifted, swung and set down a pyramid of six full drinking goblets (on a 1-ton steel test slab) without spilling a drop.

And to make this precision control pay off to the fullest extent, the Hydrocrane is equipped with four outriggers that extend in seconds, providing a rock-solid crane foundation. Truck springs are locked out through a semi-automatic spring lock-out assembly.

Simple hand controls, no hand-foot coordination required . . . 50 mph top highway speed . . . telescoping boom for reaching into hard-to-get-at-places — these are just a few of the many additional reasons why your best buy is Hydrocrane. Send coupon now.

Here the Hydrocrane with crane hook unloads 20-in. cast iron water pipe, weighing 2700 lbs. Crane is available with additional money-making attachments — four hydraulically operated buckets, magnet and grapple plus the HYDRO-HOE — A DRAGSHOVEL FRONT-END THAT IS QUICKLY, EASILY ATTACHED IN THE FIELD. Ideal for trenching and foundation work.

BUCYRUS-ERIE HYDROCRANE DIV.
South Milwaukee, Wisconsin

BUCYRUS ERIE HYDROCRANE
South Milwaukee Wisconsin

Gentlemen:
☐ Please send Hydrocrane literature.
☐ I am interested in a demonstration.

Name.....
Company.....
Address.....
City..... State.....

164H52

Now's the time to mail this month's Readers' Service card.

If this Housing ever Breaks or Distorts we will replace it Free
RIDGID
HEAVY DUTY
"RIDGID" means most service for your money!

Only Genuine

RIDGID

PIPE WRENCHES

Guarantee you against wrench housing trouble and expense

Look for the wrench with that guarantee label to make sure you get the extra-easy work and extra durability that have made RIDGID the world's most popular wrench.

Only RIDGID assures you a hookjaw that always rides freely in the housing; adjusting nut always spins easily to pipe size. Replaceable alloy jaws won't slip or lock on pipe. Handy pipe scale on hookjaw. Safe stout comfort-grip I-beam handle.

Save work and money—buy genuine RIDGIDs at your Supply House.

THE RIDGE TOOL COMPANY, ELYRIA, OHIO, U.S.A.

RIDGID

Work-Saver Pipe Tools

Need more facts about advertised products? Mail your Reader's Service card now.

With these conditions confronting us, we are always glad to read Public Works in order to find out what other communities are doing with these and similar problems.

Edward C. Uren,
Engineer,
Nevada City, Calif.

BOOKS IN BRIEF

SANITARY LANDFILL IN THE NORTH

"Sanitary Landfill in Northern States" is a 31-page booklet issued by the Public Health Service and covering studies made in cooperation with the North Dakota State Department of Health at Mandan. It indicates that this method of disposal is entirely feasible even in very cold climates. Ask for Publication 226, U. S. Public Health Service, Washington 25, D. C.

PUBLIC RELATIONS

"Public Relations for Government Employees: An action Program" has, as its basic theme, that government employees must not only do the kind of a job that people can think well of, but also must find some way to let the public know what they are doing. Prepared by Eleanor S. Ruhl. Single copy $2; less for more copies. Civil Service Assembly, 1313 East 60th St., Chicago 37, Ill.

WELDED HIGHWAY BRIDGE DESIGN

This new 240-page book presents significant designs and details of welded bridges submitted in the Lincoln Foundation's award programs. It covers structural types, floor systems, connections and details and quantities and cost. Edited by J. G. Clark, University of Illinois. Published by James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. Price in USA $2.50.

SURFACE-ACTIVE AGENTS

Among the chemicals covered in this text are wetting agents, detergents, penetrants, foaming compounds, emulsifiers and dispersing agents. Properties and applications are discussed. By J. P. Sisley and P. J. Wood, 540 pages. Chemical Publishing Co, New York, $15.

IT TAKES POWER TO RUN A CITY

Your city—any city—has to have power to keep going. Power for a hundred purposes. And International equipment supplies it.

Brute, rugged International crawler tractors for wrecking, digging, building, for sanitary fill, for the heaviest snow-clearing jobs.

Handy, sturdy International wheel tractors for mowing, towing, sweeping, and lighter work of all kinds.

Reliable International stationary engines for everything from generating electricity to pumping water.

Ask your International Industrial Distributor for details on his complete line of power equipment. Ask him about his service facilities, too.

And wherever you go, keep an eye out for the big red IH machines. Wherever you see them, you know a good job of work is being done.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

INTERNATIONAL — **POWER THAT PAYS**

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

● **Get the LATEST word on invitations and bid requirements and GET IT FIRST. Our Washington Service Bureau has daily contact with the Corps of Engineers, Air Force, Navy, and Veterans' Administration and gathers up-to-the-minute information. Bulletins are prepared showing who is issuing the invitation—the location of the job—where bids are received—when they are to be opened—the description of the project and all other available information.**

YOU can receive these valuable reports without charge or obligation by completing this coupon and sending it to our Washington Service Bureau.

YOUR INVISIBLE ARMOR IS A NATIONAL SURETY BOND OR POLICY

NATIONAL SURETY

National Surety Corporation, 4 Albany St., New York

National Surety Corporation, Dept. P
413 Woodward Building, Washington 5, D. C.

Please add our name to your contractors' mailing list.
We understand there is no charge or obligation on our part.

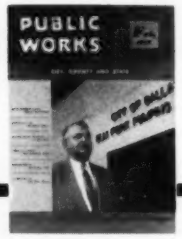
Firm Name_____

By_____ Position_____

Street Address_____

City_____ State_____

Get full details of this month's new products . . . mail your Readers' Service card today.



LEADERS IN THE PUBLIC WORKS FIELD

★

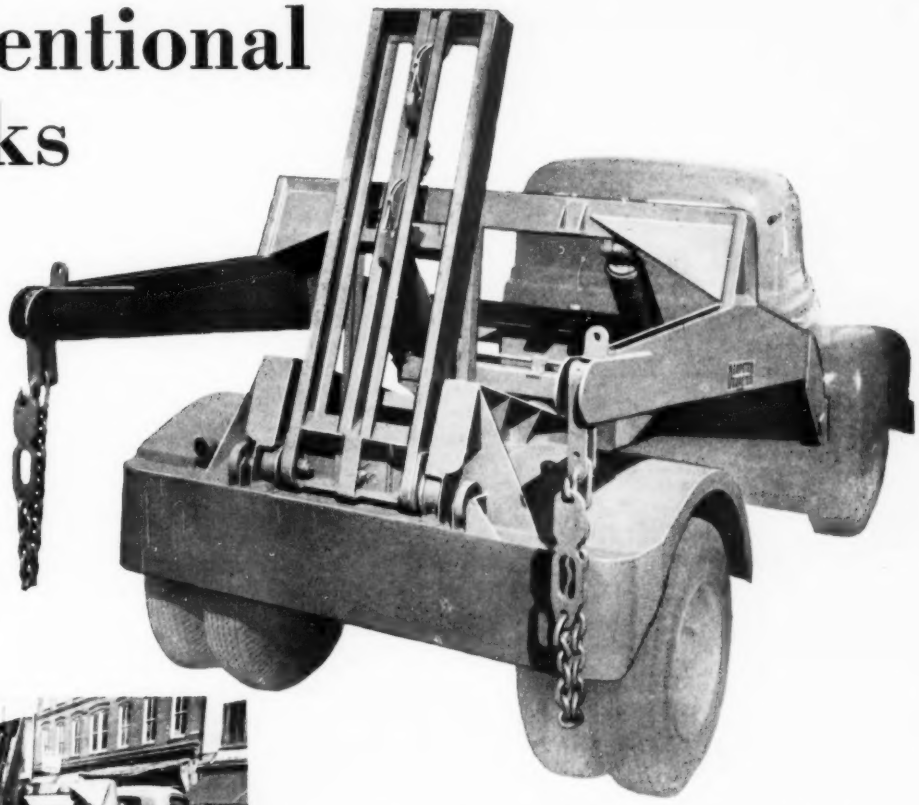
K. F. Hoefle, shown on our front cover this month, is superintendent and administrative head of the Dallas, Texas, Water Works. This Department operates both the water utility and the sanitary sewerage system, incuding the sewage treatment plants, and is entirely on its own so far as finances are concerned, not sharing in the city tax income for any purpose. Mr. Hoefle has been with the department since January, 1924, and has been superintendent since 1946. He is a graduate of Texas A & M College in Civil Engineering and is a licensed professional engineer.

He holds membership in the AWWA, and is a past chairman of the SW Section; the ASCE; Dallas Engineers Club; Technical Club of Dallas; Texas Water & Sewage Works Operators Ass'n.; and the Texas Water Conservation Association, of which he is a Director. He has been one of the authors of the Manual of Water Works Practice published by the Texas Water Works Short School; and is also author of many technical papers and articles.

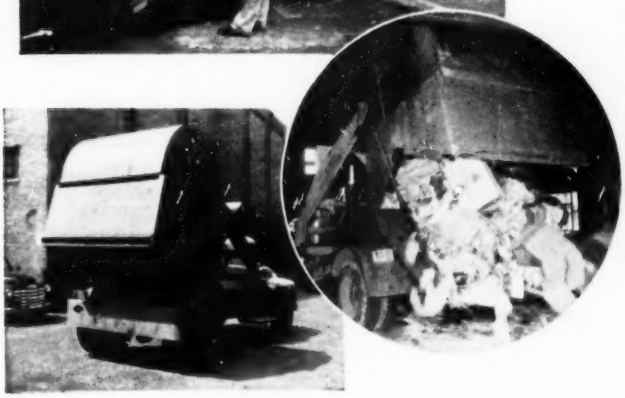
He was married in Seoul, Korea, to Mae Evans of Monmouth, Oregon, and two of his sons were born in North Korea, though his daughter is a native Texan. His hobbies, he says, are fishing and woodworking, with spasmodic attacks of the stamp collection fever. He is one of the strong men in the water works field and the City of Dallas is fortunate to have him to guide it through its many problems compounded of water scarcity and rapid growth.

The DEMPSTER DUMPSTER® Rubbish Collection System

Eliminates 3 to 5 Conventional Trucks

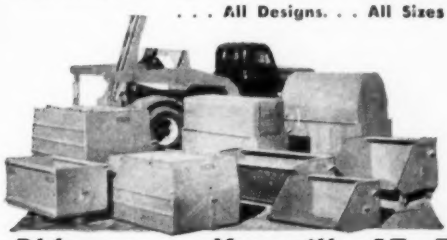


THREE STAGES of quick pick-up, hauling and dumping are shown while Dempster-Dumpster is at work in Norfolk, Va.



One truck-mounted Dempster-Dumpster picks up, hauls and empties, one after another, a multiple number of detachable containers . . . eliminating 3 to 5 conventional trucks and crews. Containers are spotted at hospitals, schools, business establishments, etc. and loaded by the user. Container sizes range up to more than three times the capacity of the average dump truck body. For low cost, efficient and sanitary bulk rubbish collection, your city needs the Dempster-Dumpster System. Manufactured exclusively by Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers . . . All Designs. . . All Sizes



DEMPSTER BROTHERS 923 Dempster Bldg. Knoxville 17, Tenn.

Thousands use our Readers' Service card to keep up to date . . . do you?

FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

The engineering information in these helpful catalogs will aid you in Engineering and Public Works programs. Just circle numbers you want on the coupon or write the manufacturer direct and mention PUBLIC WORKS.

Head Loss Data On Plastic Pipe

26. Carlon Products Corp., 10225 Meech Ave., Cleveland 5, Ohio, announces that authoritative data has been compiled on head loss due to friction in Carlon plastic pipe and is available in the form of graphs and charts. The graphs show superior flow characteristics, attributed to the fact that plastic pipe is not "wetted" by water. Send for this data today by using the handy coupon.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

What You Should Know About Refuse Incinerators

58. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the coupon.

Handbook of Cast Iron Pipes and Fittings

66. "Pipe Economy", the handbook of Clow-National Pipe products and fittings for water, gas and sewers has become a standard reference in the library of engineers and designers everywhere. You can obtain a copy of the latest edition by checking the coupon. Issued by James B. Clow & Sons, 201 N. Talman Ave., Chicago 80, Ill.

Drill Concrete Faster and Easier

146. Your rotary electric or air drill, used with RCD drill bits, will drill precision holes even in reinforced concrete. Bits available in ¾" to 4" sizes and larger. Get illustrated bulletin and price list from Rotary Concrete Drill Co., 650 S. Arroyo Pkwy., Pasadena 1, Calif. Just use the coupon.

Propeloflo Meters Check Water Usage

104. Water saving programs start with flow data, and the versatile Propeloflo meter will get the facts you need. Available for lines 2" to 36" in diameter or larger, with electrical or mechanical remote indicating, recording and totalizing. All the facts in Bulletin 380-G2A from Builders-Providence, Inc., 356 Harris Ave., Providence 1, R. I. Check the coupon today.

Bar Screens and Screenings Disintegrators

153. In a 24-page, two-color bulletin, "The Dorrco Bar Screen and the Dorrco Sulzer Disintegrator," you will find details on two types of screens, the disintegrator and the units in combination, as well as control mechanisms. Be sure to investigate this modern combination to solve the sewage screenings problem. Check the coupon or write The Dorr Co., Stamford, Conn. for your free copy.

Design Data on Rotary Distributors and Automatic Dosing Siphons

40. Bulletin #5210 presents a detailed description of various types of Carter rotary distributors, including photographs, cutaway drawings and complete engineering drawings. Similar data is presented for automatic dosing siphons. A convenient selection chart shows velocities in columns and arms under all flow conditions. Get this comprehensive bulletin by writing to Ralph B. Carter Co., 209 Atlantic St., Hackensack, N. J., or check the coupon.

Excellent Booklet Shows Aerial Mapping Technique

235. A clear explanation of the technique of aerial topographic map production is given in "Air Speeds Your Map Needs." Striking photographs trace aerial photos step-by-step to the final maps for highway location, city and regional zoning and planning, traffic studies, drainage and watershed projects, tax maps and many other types of work. Use the coupon to get this excellent booklet for public works and planning officials. Jack Ammann, Photogrammetric Engineers, 829 N. St. Mary's St., San Antonio 2, Texas.

Save Costly Digging— Locate Pipes and Fittings Accurately

257. Save time and money with the precision Pathfinder detector for locating pipes, tees and valves. Powerful detecting unit tells you where to dig. For full details check coupon or write Pathfinder Co., 1726 Beverly Dr., Pasadena 7, Calif.

Helpful Data on Sluice Gates

158. In a well-organized 48-page catalog you will find complete engineering and design data on Pekrul sluice gates, headgates, automatic flap gates, lifts and accessories. Numerous models in 6" to 92" sizes are available, and all pertinent data will be found in this helpful booklet. Write Morse Bros. Machinery Co., Denver, Colo., or use the coupon.

Inserting Valves Without Shutdown

162. Do you have the latest data on equipment for inserting control valves where shutdown is impractical? Mueller catalogs H-20 and H-602 give all details on inserting valves and equipment, using hand-operated or power-operated machines. Get these catalogs today by checking the coupon. Mueller Co., Decatur, Ill.

Complete Catalog on Plumbing Drainage Products

169. Josam Catalog "K", said to be the most complete ever offered on plumbing drainage products, includes floor drains, roof drains, interceptors, sewer backwater valves, swimming pool fittings and many other specialties. Careful arrangement helps the designer find just what he wants. Your copy is waiting. Just check the coupon or write Josam Mfg. Co., Dept. X35, Michigan City, Ind.

How Air Placement of Concrete Will Help on Your Jobs

215. There are hundreds of jobs that can be done easier and cheaper by air placement of concrete: reservoir, tank and pool linings, concrete maintenance of all sorts are just a few of the applications. Get full details on two models of the high speed, easily operated "Bondactor" from Air Placement Equipment Co., 1009 West 24th St., Kansas City 8, Mo. Check the coupon.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

2-53

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

STOP READ AND SEND

Booklets from pages 28 to 42:

	20	21	25	26	29	30	31	34	35	36
40	43	45	46	48	49	58	60	61	62	64
65	66	77	78	80	81	86	87	91	92	96
99	100	102	104	107	109	110	112	121	122	123
126	127	137	139	145	146	147	150	151	153	155
158	162	163	168	169	172	173	174	176	177	178
182	183	186	193	199	209	211	212	215	216	220
221	222	224	229	232	234	235	236	237	239	244
252	257	258	259	262	263	267	271	272	273	277
278	280	281	286	290	291	294	295	296	299	304
310	312									

New Products, pages 124 to 127:

2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9
2-10	2-11	2-12	2-13	2-14	2-15	2-16	2-17	

Name .....

Occupation .....

Street .....

City ..... *State*.....

NOT GOOD AFTER MARCH 31, 1953 ◀ **MAIL THIS CARD NOW**

the OLIVER Model "B" Crawler

WITH WARE LOADER

Long considered the finest tractor-loader combination in its class, the Oliver-Ware Model "B" is now built for even greater performance. There are now 5 lower track wheels instead of 4, and the front idler wheel is considerably larger. This means you get more track on the ground, greater stability, more traction, easier handling all the way around. It means faster loading cycles, more work done per day, lower costs and more profits for you.

You still get the hydraulically-controlled Ware loader—designed and built exclusively for the Oliver Model "B" Crawler. 110° bucket rotation and 28° "tilt back" give you a full bucket every time. Bucket level is automatically maintained when lifting load, preventing wasteful spillage. You can control speed of discharge. And, even with the "tilt back" action, you still have a 32° (from vertical) dump angle . . . a control range no other loader can surpass.

For complete information on how the Oliver-Ware Model "B" tractor loader can cut costs for you, see or write your Oliver Industrial Distributor.

THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

A complete line of industrial wheel and crawler tractors

Need more facts about advertised products? Mail your Reader's Service card now.

To order these helpful booklets check the coupon on page 28.

Conveyors for Sludges, Compost and Chemicals

263. The Hapman conveyor system will move almost any flowable material, wet or dry, through any plane or angle. Design data and case study file show applications for water plants, sewage plants and industries. Get this interesting and helpful information from Hapman Conveyors, Inc., Kalamazoo, Mich., by checking the coupon.

Be Sure To Investigate Truck Shovels

286. A complete and factual booklet issued by "Quick-Way" Truck Shovel Co., Denver,

Colo., gives all the details on four truck shovel models. Profuse illustrations and descriptive copy show the reader how these adaptable machines do the work quicker and easier. Check the coupon for your free copy.

Stop Rust!

262. New 1953 catalog of Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill., gives complete instructions for surface preparation and application of coatings and colorful finishes. Included are 73 color chips. Helpful question-and-answer section gives extra information on rustproofing. Check the coupon for your copy.

Guide Book of Hard-Facing Applications

30. The new, revised edition of the Stoody Hard-Facing Guide Book shows 140 ways to cut replacements, increase equipment life by manual hard-facing. Get a copy today and see how hard-facing alloys are applied to construction equipment, pump impellers, trenchers and other equipment you use. Use coupon or write Stoody Co., 11925 E. Slauson Ave., Whittier, Calif.

Aerial Surveys and Maps from Photographs

229. Written in non-technical language, a 16-page booklet with this title gives a complete explanation of aerial surveys for the municipal field. Illustrating step-by-step pictures show how planimetric and topographic maps, mosaics and atlas sheets are produced by Abrams Aerial Survey Corp., Lansing 1, Mich. Check the coupon for your copy.

Porous Media Handbook For Sanitary Engineers

222. A really helpful 56-page booklet just published by the Carborundum Company tells the complete story of the use of porous media in the fields of water and sewage treatment. The major portions are devoted to water filtration and air diffusion for activated sludge treatment. Diagrams show the many installation methods used, and full data is provided for the designing engineer. General data and specification sections complete this valuable reference bulletin. Get Form 5118 by checking coupon or write The Carborundum Co., Refractories Div., Perth Amboy, N. J.

What You Should Know About Turbine Pumps

294. In a colorful bulletin titled "Water, Where You Want It . . . When You Want It" the Johnston Pump Co., 2324 East 49th Street, Los Angeles 58, Calif., gives details on turbine pumps with both semi-open and closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1013 by checking the coupon.

Drill Concrete With Your Ordinary Electric Drill

295. Substantial cost-per-hole savings are claimed for Tilden Rotary Drills which penetrate 2" to 4" per minute. Available in sizes ¼" to 4". Cutters can be resharpened. Full data from Tilden Tool Co., 209 Los Molinos, San Clemente, Calif. Just check the coupon.

●

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Valuable Booklet on Porous Diffuser Plates and Tubes

21. A helpful 20-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in activated sludge plants. Full data for the designing engineer is provided by careful detailing of physical characteristics of plates and tubes. Maintenance of porous media also is discussed at some length. For your copy of Form 1246, write the Norton Co., Dept. PW, Worcester 6, Mass., or use the coupon.

Complete Data On Sludge Pumps

193. Sludge pumps, simplex, duplex, triplex and quadruplex, normal and heavy duty models, are described in Bulletin S48 issued by Marlow Pumps, Ridgewood, N. J. Check the handy coupon for your free copy.

The FRINK WON'T RIDE UP
.....When Properly Adjusted

Frink Reversible Type, One-Way Type, and V-Type Sno-Plows are interchangeable on the same truck attachment.

NOTICE: If you have had to wait months for replacements for your present equipment then you will appreciate the service that we can now offer you.

A distinctive feature of Frink Sno-Plows is the entirely different hook-up that prevents them from riding up when properly adjusted.

By means of the patented Heel Adjusting Chain (Fig. A.) at the rear of the plow, and the weight of the snow on the mouldboard, a downward pressure is applied to the plow, preventing the nose from riding up.

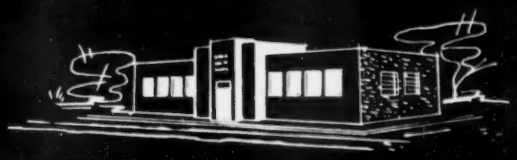
Drive Bars (Fig. B), pivoted at both ends, plus the Heel Adjusting Chains (shown at left) are the keys to this outstanding feature, and are found only in Frink V-Plows.

For details of this Sno-Plow write for catalog to nearest address below, Box PW 532

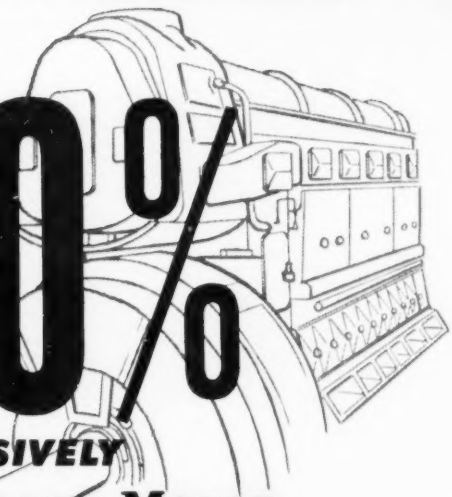
FRINK SNO-PLOWS

FRINK SNO-PLOWS, INC., CLAYTON, NEW YORK
DAVENPORT-BESLER CORP., DAVENPORT, IOWA
FRINK SNO-PLOWS of CANADA, LTD., TORONTO, ONT.

CITY-OWNED ELECTRIC GENERATING PLANTS



IN THE STATE OF MINNESOTA



60%

EXCLUSIVELY

FAIRBANKS-MORSE

60% . . . of the city-owned diesel power plants in Minnesota are *exclusively* powered by Fairbanks-Morse engines!

Add all other plants where F-M engines are used and the total becomes 76%.

Operating on diesel oil, natural gas or crude oil, these Fairbanks-Morse engines are generating over 53% of the total KVA capacity—and are producing important savings.

In Minnesota—or your state—*facts* establish the superiority of Fairbanks-Morse diesel and dual fuel engine performance. Their dependability, economy and low maintenance assure the best in power generation service—at a profit. Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY
PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY• MAGNETOS

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

Packaged Sewage Treatment— Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill.

A Handbook of Sewer Cleaning Equipment and Methods

46. A fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new SewerRodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

Helpful Installation Manual For Drainage Structures

62. A 46-page manual, well worth careful study by designers and field engineers dealing with drainage structures, culverts, sewers or conduits, is offered by Armco Drainage & Metal Products, Inc., Middletown, Ohio. Proper location of the structures, base preparation, assembly and backfill are some of the many items covered in detail. Use the handy coupon for free copy.

For prompt catalog service always use the PUBLIC WORKS reply card or coupon.

Make Your Own Concrete Pipe For Sewers and Culverts

65. Machinery for making concrete pipe for sewers and culverts, both plain and reinforced, sizes 4" to 36", is described in bulletins of the Concrete Pipe Machinery Co., Sioux City 17, Iowa. Either bell and spigot or tongue and groove can be made. Get full details by using the coupon.

Helpful Design Data For Sewage Ejectors

81. The applications and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

Floatless Liquid Level Controls

92. Complete descriptions of electrode type floatless liquid level control systems, including control units, electrodes and fittings, panel assemblies and diagrams of typical installations for all types of municipal service are covered in the 32-page catalog of Charles F. Warrick Co., 1956 W. Eleven Mile Rd., Berkley, Mich. Check coupon for your copy.

Durable Gratings and Treads Are a Good Investment

147. Gratings for walks around settling tanks and other parts of treatment plants, both out-doors and in, for stairways, floors, and balconies, are described in an illustrated 16-page bulletin by Irving Subway Grating Co., 50-53 27th St., Long Island City 1, N. Y.

Non-Clogging Vertical Wet-Pit Pump Described

182. Full engineering data on Worthington "Freeflo" wet-pit pumps with non-clogging impellers capable of passing solids and stringy material are included in Bulletin W-317-B12. Check these pumps for sump, sewage and drainage service. Bulletin available from Worthington Corp., Harrison, N. J. Just use the coupon.

How Vacuum Filters Help Your Sewage Sludge Disposal

209. Applications of the Conkey sludge filter to all types of sewage sludge are described in Bulletin 100. Tables show filter sizes, weights, and give anticipated average results. Use the coupon to order your copy. General American Transportation Corp., Process Equip. Div., New York 17, N. Y.

How to Compute Quantities of Jointing Materials

271. A helpful table for determining quantities of "Tegul-Mineralead" required, using jute or "Hyde-Ro Rings", plus complete answers to your questions on sulfur compound jointing materials will be found in Bulletin M-10 issued by Atlas Mineral Products Co., Mertztown, Pa. Check the handy coupon today.

Reference Book on Lubricated Plug Valves

273. Lubricated plug valves, including stick-proof lever sealed valves for easy operation and positive mechanical seal are fully described in reference books issued by Homestead Valve Mfg. Co., Box 550, Coraopolis, Pa. Check the coupon for your copy.

The "PELICAN" PUMP

THE WONDER PUMP OF THE

Lightweight Field

AND THE LOWEST PRICED TWO-INCH PUMP OF ITS CAPACITY ON THE MARKET!

The "Pelican" self-priming centrifugal pump challenges any pump its size and type to equal it in performance.

Quickest priming, Fastest pumping, Most dependable

Suction Lift - up to 25 feet, sea level.

Automatic Self-priming - no ports, no valves.

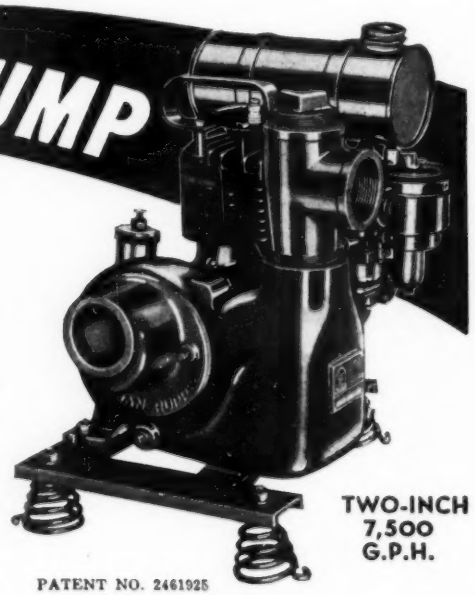
Portability - weighs only 70 pounds, provided with carrying handle for easy portability.

Non-clogging - any muck or solids that will pass the intake strainer will pass through the pump.

Simplicity - the impeller, the only moving part, is mounted directly on the engine shaft and operates at engine speed.

The "Pelican" is a reliable, trouble-free, general utility pump small enough for easy handling and large enough for a wide range of applications in municipal utility field.

Write for bulletin No. 7-LW-13.



TWO-INCH 7,500 G.P.H.

PATENT NO. 2461925

FOUR GORMAN-RUPP LIGHTWEIGHTS

The Midget, 1½" - wgt. 62 lbs., 5500 g.p.h. Primes in 75 sec. at 25 ft. suction lift.

The Pelican, 2" - wgt. 70 lbs., 7500 g.p.h. Primes in 75 sec. at 25 ft. suction lift.

The Hawk, 2" - wgt. 110 lbs., 10,000 g.p.h. Primes in 47 sec. at 25 ft. suction lift.

The Eagle, 3" - wgt. 117 lbs., 18,000 g.p.h. Primes in 79 sec. at 25 ft. suction lift.

THE GORMAN-RUPP COMPANY

MANSFIELD, OHIO

1,000,000

INDUSTRIAL ENGINES

built in ONE year

It's a new world production record — never before accomplished. For 33 years BRIGGS & STRATTON has been establishing a long list of firsts. And now, in 1952, another is added.

BRIGGS & STRATTON is recognized as the pioneer and the leader in its field . . . setting new standards, year after year in engineering, in design, in engine performance and in precision mass production.

Whether you are a manufacturer, dealer or user of gasoline engine powered equipment — you are assured of top performance when you specify BRIGGS & STRATTON 4-cycle, single cylinder, air-cooled engines. They are the "preferred power" value all over the world.

BRIGGS & STRATTON CORPORATION
Milwaukee 1, Wisconsin, U.S.A.

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

BRIGGS & STRATTON 4-cycle, single cylinder, air-cooled engines are available from ¾ to 8¼ hp. — in many models and types. They are preferred power for hundreds of types of machines, tools and appliances. All are backed by a world-wide service organization, factory supervised, unequalled in the industry.

In the automotive field, too, Briggs & Stratton is the recognized leader — and the world's largest producer of locks, keys, and related equipment.

Now's the time to mail this month's Readers' Service card.

To order these helpful booklets check the coupon on page 28.

End Root Problems With Root-Proof Sewers

107. Troubles caused by roots and corrosions in house connections can be eliminated by the use of root-proof Bermico sewer pipe. Full details on this smooth, waterproof, tight-sealing pipe available by checking the coupon, or write to the Brown Co., Dept. PW, 150 Causeway St., Boston 14, Mass.

Efficient Blowers for Activated Sludge Plants

232. Many advantages of Roots-Connersville positive displacement rotary blowers are described in Bulletin 22-23-B-13, which also provides characteristic curves for operation with constant speed, multi-speed and variable speed motors and details of several types of blowers. Get this helpful bulletin by checking the coupon. Roots-Connersville Blower Corp., Connersville, Ind.

General Catalog on Measuring and Controlling Equipment

272. The full line of Simplex equipment for the measurement and control of liquids and gases in water and sewage plant installations is illustrated and described in detail in 28-page Catalog 003. Every engineer should study the design data in this helpful booklet. Write Simplex Valve & Meter Co., 68th & Uplands Sts., Philadelphia 42, Pa., or use the coupon.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering-Superheater, Inc., Flash Dryer Div., 200 Madison Ave., New York 16, N. Y.

What You Should Know About Design and Use of Concrete Sewers

122. Every engineer and contractor should have a copy of the 48-page book "Concrete Sewers" in his library. This valuable text, published by the Portland Cement Assn., 33 W. Grand Ave., Chicago 33, Ill., gives an authoritative discussion of hydraulics, sewer design, construction and maintenance. Generous use of helpful illustrations makes the book attractive and helpful to the reader. For your copy, just check the handy coupon.

●

STREETS AND HIGHWAYS

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

A Clean Sweep With Tractor-Mounted Sweeper

77. The Lull fluid drive "Super Sweeper" with automatic terrain compensator gives a clean sweep without excessive brush wear despite rough terrain. Finger-tip hydraulic controls regulate broom speed and angle. For full details write Baker-Lull Corp., 380 West 90th St., Minneapolis 20, Minn., or check the coupon.

The Manufacturers' literature described on these pages is costly, so order just what you need. Use the handy mailing card or coupon today.

Get Data Now On This Catch Basin Cleaner

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

What's Your Traffic Problem?

127. Traffic signals and controllers of every type are offered by Eagle Signal Corp., Moline, Ill. You will find a great deal of helpful data and diagrams of typical installations in Bulletins A 10 and C 10, available by checking the coupon.

Uniform Salt Spreading Saves Material

145. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Versatile Maintainer Has Year 'Round Usefulness

151. The sturdy Huber Maintainer will work for you the year 'round on mainteance jobs, berm leveling, road planning, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

How MUD-JACK STABILIZES SUB-GRADES

Send for 20-page engineering handbook on Koehring Mud-Jack method

Koehring Mud-Jack® pumps inexpensive soil-cement slurry into small holes drilled thru pavement . . . raises the concrete slab, leaves firm, lasting sub-grade. Corrects grades of curbs, gutters, sidewalks, driveways. Two sizes: compact, portable No. 10 (illustrated) for city work, and bigger No. 50 Mud-Jack for preventive maintenance and low-cost repairs on highways.

TO: KOEHRING COMPANY, Milwaukee 16, Wis.

NAME .....

STREET .....

CITY ..... STATE .....

X268PW

- Pump Controls
- Duplex Pump Alternators
- High and Low Level Cutoffs
- High and Low Level Alarms
- Multi-level Signals
- Liquid Metering
- Special Controls and Panels

Write For 32 Page Catalog

●

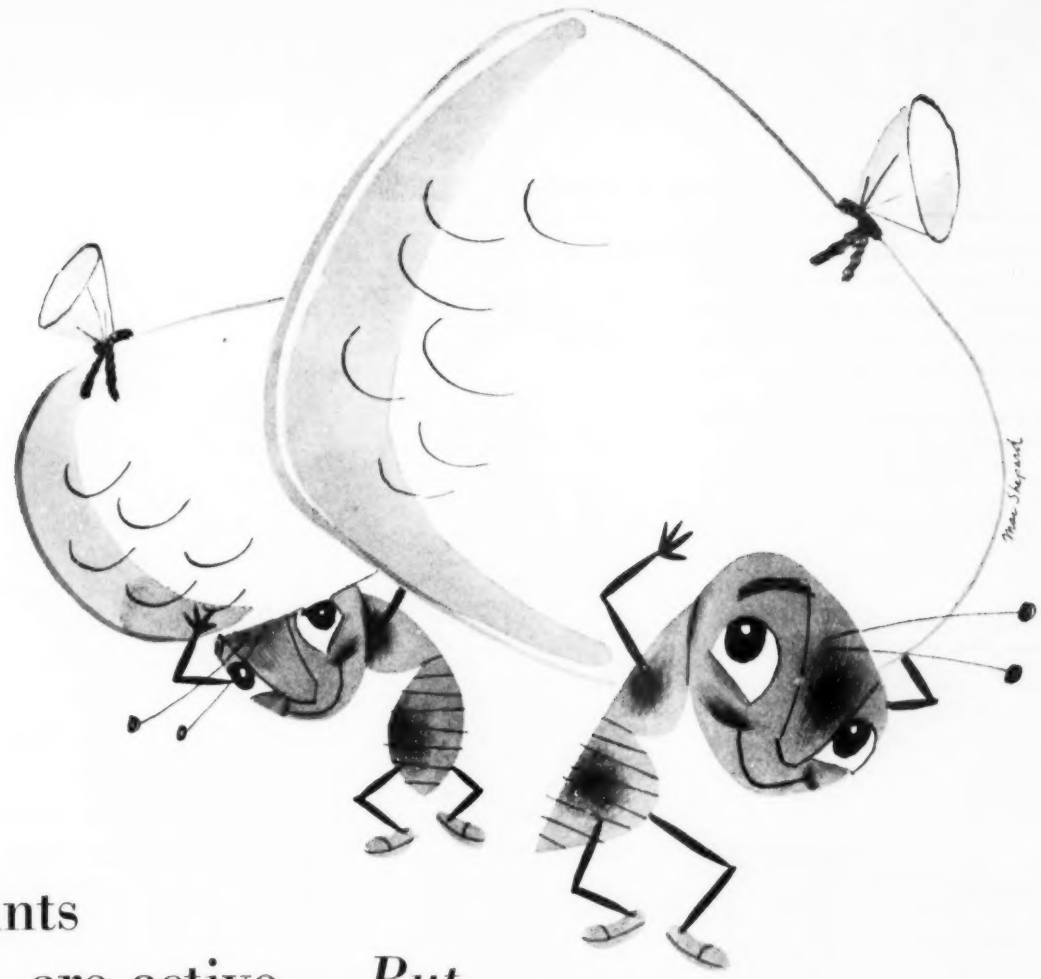
Buffalo, New York Territory Still Open

CHARLES F. WARRICK CO.

1956 W. Eleven Mile Rd. Berkley, Mich.

Warrick

FLOATLESS LIQUID LEVEL CONTROLS ELECTRODE TYPE



Ants are active . . . *But* . . .

For *real* activity you should see what's going on in our Bermico plant. We're trying 24 hours-a-day to make enough Bermico Sewer Pipe for everybody.

Bermico's popularity makes us happy . . . that's why we're pushing production to the limit, while still maintaining Bermico's unusually high standard of quality.

Bermico—the cellulose, pitch-impregnated pipe for outdoor, underground, non-pressure use—is root-proof, corrosion-proof, easy to work and handle, light in weight, and can be counted on for a lifetime of trouble-free service.

We appreciate your patience—and are working hard to fill your orders for Bermico as fast as they come in.

BROWN QUALITY COMPANY, Berlin, New Hampshire
CORPORATION, La Tuque, Quebec

General Sales Offices: 150 Causeway Street, Boston 14, Mass.
Dominion Square Building, Montreal, Quebec

SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWLS • BERMICO SEWER PIPE, CONDUIT & CORES • ONCO INSOLES • CHEMICALS

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

To order these helpful booklets check the coupon on page 28.

Latest Data on Rubber Roads

296. A report covering all developments to date on the use of natural rubber in road surfacing of asphalt highways has been issued by the Natural Rubber Bureau, 1631 K St., N. W., Washington 6, D. C. Get your copy of this 52-page booklet which includes new data on research and full reports on test roads in many states. Use the handy coupon.

Over one hundred items are listed here and in the New Equipment section. Order what you need today. Just check the coupon.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Lafayette, Ind. or use the coupon.

A Helpful Booklet For Those Who Build and Maintain Roads

310. "Governmental Graders," a booklet published especially for the 18,000 governmental agencies with jurisdiction over local rural roads tells how the three sizes of "Cat" motor graders do the job on road building and maintenance programs. Of particular interest is a table of repair costs compiled from public records. Get your copy from the Caterpillar Tractor Co., Peoria 8, Ill., or by checking the coupon.

Fast Mowing in Hard-to-Reach Places

163. The lightweight, power driven Scythette mows smoothly near walls and trees or in rocky, hard-to-reach places; does the job 4 times faster than hand methods. Interchangeable chain saw unit, the Sawette, cuts trees and other growth up to 6" diameter. Check the coupon for illustrated folder offered by Hoffco, Inc., Richmond, Ind.

Check the Features You Need In Motor Pick-Up Sweepers

199. Big hopper capacity for central dumping; full floating broom suspension; unobstructed vision for operator; trouble-free elevator; full front axle and rear wheel steering; big gutter broom; plenty of power; and standardized parts are Wayne Model 450. Get form 101 from Wayne Mfg. Co., Pomona, Calif. for all the details. Check coupon today.

WATER WORKS

Seven Advantages of Prestressed Concrete Steel-Cylinder Pipe

43. All the things you want in water supply lines: permanency, structural strength, high carrying capacity, easy tapping, design flexibility, easy installation and economy are claimed for Prestressed Concrete Steel-Cylinder Pipe made by Price Brothers Co., 1932 East Monument Ave., Dayton 1, Ohio. Get full details by checking the coupon.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn.

Bulletin Helps Specify A.W.W.A. Valves

64. All the facts you need to know when designing, ordering or specifying A.W.W.A. valves will be found in Bulletin 106, issued by Kennedy Valve Mfg. Co., Elmira, N. Y. Detailed specifications are provided on the wide range of types, sizes, controls, accessories and connections available. Check the coupon to get this valuable reference material for your permanent file.

To Restore Capacity Of Water Lines

78. Water pipe cleaning service by hydraulic methods, power driven cleaners for scale and encrustation removal, plus relining of water mains are services offered by Ace Pipe Cleaning Contractors, Inc., 2003 Indiana Ave., Kansas City, Mo. For full description of these and other pipe cleaning services get the illustrated Ace catalog. Just check the coupon.

Reconditioning Pipe Lines With Cement-Mortar Linings

80. Pipe lines from 4 to 144 inches in diameter can be cement lined in place by the Centriline and Tate Processes. Catalog 9-52-5M describes how this operation gives new pipe line perfomance for a fraction of the cost of new pipe and shows how the work is done. Check coupon for your copy. Centriline Corporation, 140 Cedar St., New York 6, N. Y.

Tested Jointing Materials

102. "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydraulic Development Corp., 50 Church St., New York, N. Y.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

NEW IMPROVEMENTS
Cable Drum Clutch
Upper Arch Sheave
Automatic Cable Level Wind

OK CHAMPION Power Sewer Cleaner

Twin rigs take debris from sewer to street in one operation.

Mounted on four wheel trucks—safer—eliminates lifting over or pulling away from manholes—safer tandem towing.

All Controls at Working End—keeps operator out of passing traffic—allows full vision of work.

Built-in Gear Reduction Ratio—allows better use of power for bucket travel.

Fully Automatic Safety Clutch—instant acting—avoids damage to tiles and machines.

Rely on the pioneer manufacturer of power sewer cleaners.

CHAMPION CORPORATION
Hammond, Indiana

SEND FOR LITERATURE

Champion Corporation, 4752 Sheffield Ave., Hammond, Indiana
Please send information on new OK Champion Power Sewer Cleaners.

Name.....Title.....

Address.....

The **NETCO** CATCH BASIN CLEANER
WITH PNEUMATIC CONTROLS

A Necessity For Every Municipality

- **Simple**
- **Positive**
- **Powerful**

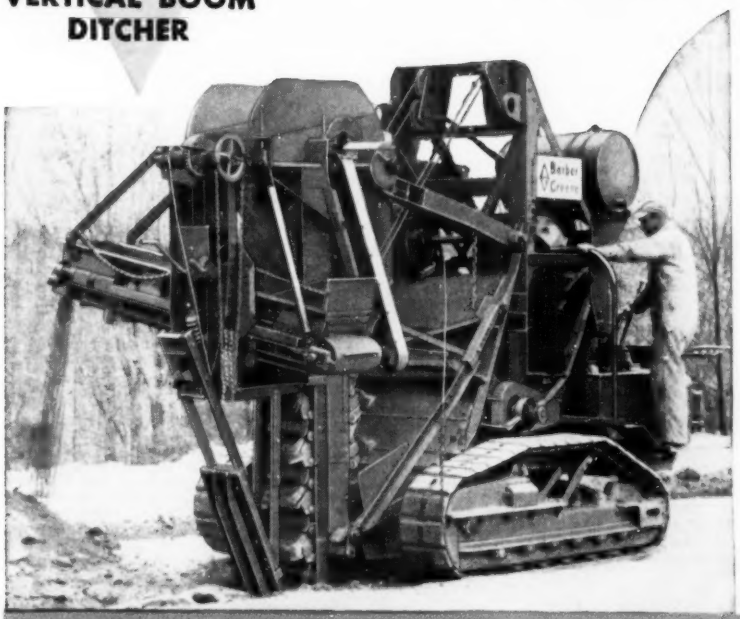
Easily mounted on any short wheel base truck with 8 ft. in back of the cab, the Netco can be operated continuously, averaging 20 to 30 catch basins a day. The Netco with its two powerful pneumatic buckets (orange peel or clamshell) is simple to operate, has a hoisting capacity up to 1500 lbs., and easily removes all debris through openings as small as 16 inches.

NETCO DIVISION
CLARK-WILCOX COMPANY
118 Western Avenue
Boston 34, Massachusetts

BARBER-GREENE HEAVY DUTY DITCHER

MODEL 44-C VERTICAL BOOM DITCHER

for lowest cost per foot of trench in all weather



SAVE ON JOBS LIKE THESE:

Highway Widening
Sewer, Water and Gas Distribution
Pipe Line Construction
Airport Drainage
Uncovering Joints
Placing Conduit Tile
Building Foundations
Farm Tiling
Grave Digging

DIGS CLEAN **... leaves vertical walls . . . square cuts . . . eliminates most expensive handwork.**

MILLING ACTION **... closely spaced buckets pare small increments as a milling machine cuts metal.**

OVERLOAD RELEASE **... slips when overload occurs . . . automatically re-sets itself . . . no down time for replacing shear bolts, etc.**

Only Barber-Greene offers so many proved ditcher advantages to save time and money on all trenching operations. For instance, the Vertical Boom means a compact, easily maneuvered machine: digs straight down, right up to walks, foundations, underground pipes, etc. . . . digs *all* the ditch . . . no expensive handwork required. The Vertical Boom stays *down* — the harder the digging, the harder the buckets hold it down. Cuts trench to 8'-3" depth, 24" wide.

Self-cleaning "kick-out" buckets operate in a vertical plane . . . produce the famous B-G milling action that cuts through coral, frozen ground, caliche and other formations that completely stop other ditchers.

Another time- and money-saving feature is the exclusive B-G overload release that slips on overload and automatically resets itself until the obstruction is removed or the operator stops machine—and then it re-sets itself for continued operation, protecting machine, hidden mains, cables, etc.

Plan to put the advantages of the B-G Model 44-C to work for you.

Barber-Greene BG

Aurora, Illinois, U. S. A.

Thousands use our Readers' Service card to keep up to date . . . do you?

To order these helpful booklets check the coupon on page 28.

Water Treatment Unit For Small Supplies

87. A complete-package water treatment unit to treat 5 to 100 gallons per minute is described in Bulletin 1845, issued by Infilco Inc., Box 5033, Tucson, Ariz. Unit softens, clarifies, sterilizes or removes organic matter, tastes or odors. Requires a minimum of attention. Investigate this unit whenever dependable treatment is needed for small domestic supplies. Check the coupon today.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

How to Tap Concrete Pressure Pipe

126. The simple steps required in making a pressure tap in concrete pressure pipe are explained in a booklet issued by Lock Joint Pipe Company. Be sure you know how either large connections or small service outlets may be made economically and without sacrifice of strength. Just check the handy coupon. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the coupon for full information including table of filter sizes and capacities, space required and filter operation.

What You Should Know About Fluoridation and Fluoridators

155. Two helpful publications issued by Wallace & Tiernan titled "Fluoridation" and "Fluoridators" show the development of fluoridation, list the chemicals and dosage normally used, and give full technical data on solution feed and dry feed fluoridators. Be sure to get these publications from Wallace & Tiernan by checking the coupon today.

Helpful Data on Well Water Systems

173. A comprehensive, 48-page book on Layne Water Well Systems covers gravel wall wells, underreaming, cemented walls, rock wells and other well types. Applications of shutter screens and vertical turbine pumps are shown, together with water treatment and conditioning equipment. Ten pages are devoted to useful engineering tables and measurement data. Check the coupon today or write Layne & Bowler, Inc., Dept. PW, Memphis 8, Tenn.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co, Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

Design Data on the Circuline Sludge Collector

237. All the information you need for the design of circular settling tanks using the Link-Belt Circuline sludge collector will be found in 20-page Book No. 1982, published by Link-Belt Co., P.O. Box 472, Lansdale, Pa. Capacity tables, suggested sizes for all piping and design details are included. Check the coupon for your copy of this valuable booklet.

Attractive Bulletin Features Large Elevated Tanks

252. In a 24-page booklet, "Horton Elevated steel Tanks of Large Capacity," Chicago Bridge & Iron Co., Chicago 4, Ill., describes the advantages of using large elevated steel tanks to provide gravity pressure in municipal water systems. Detailed information on radial-cone tanks of 500,000 to 3,000,000-gal. capacity and Horton-spheroidal tanks of 1,000,000 to 3,000,000 gal. is included in this really handsome bulletin. Check coupon for your copy.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Pressure Reducing Regulator Has High Inlet-to-Outlet Ratio

172. Get full data on the 50-G2 pressure reducing regulator that permits inlet-to-outlet ratios of 250 to 2 lbs. at accuracies approaching instrument control. Bulletin G-101, available from Foster Engineering Co., 825 Lehigh Ave., Union, N. J. gives full details. Check the coupon.

Avoid Needless Digging With This Valve Box Locator

178. Convenience and accuracy are keynotes of the Aqua Valve Box Locator described in a full color folder by Aqua Survey and Instrument Co., 2518 Leslie Ave., Cincinnati 12, Ohio. Cobalt alloy steel dipping needle is factory-set for any geographic location. Get full details by checking the coupon.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

Locate Mains and Services Without Digging

186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes and valves by electronic means. Proper manipulation also determines depth of cover. Battery operated unit is readily carried by one man. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.

How to overcome industrial waste problems economically and effectively

Just Out!

INDUSTRIAL WASTE TREATMENT

By Edmund B. Besselievre

Chief Sanitary Engineer, International Sales, The Dorr Co.

370 pages, 100 illus., 55 tables, $7.50

This working guide helps you launch and carry through a practical program of solution at a minimum cost and maximum results. In it the component factors and economical aspects of the waste problem are discussed, enabling you to properly evaluate them and arrive at a successful solution. It summarizes the functions and jurisdiction of various agencies as well as the laws controlling discharge of wastes into streams.

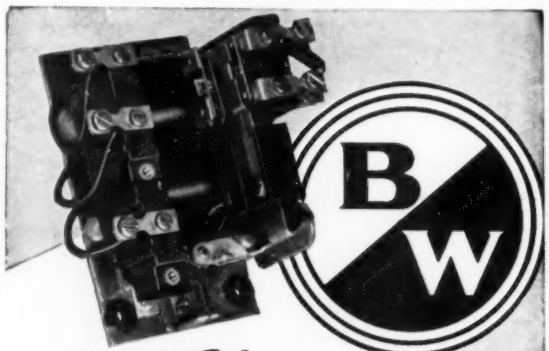
Tells how to:

- determine the degree of treatment required
- determine the volume of waste
- separate materials from liquids by gravitational sedimentation
- treat dairy wastes
- treat wastes from fermentation industries
- treat chemical plant wastes

The methods, treatment plants, and units of equipment available for waste treatment are described, with numerous flow diagrams and photos showing their successful use. To minimize stream pollution and reduce costs of treatment, the book points up considerations of plant design and construction and techniques of reclaiming byproducts from industrial wastes. A wealth of background information—working methods and data you can use to profit, are embraced in this single volume.

PUBLIC WORKS MAGAZINE

310 East 45th St. — New York 17, N. Y.



All-Electric Floatless

LIQUID LEVEL CONTROLS

● Write for latest catalog covering the complete line of B/W Induction Relays, Induction Relay Switches, Relay Enclosures, Contactors and Starters, Multiple Pump Controls, Electrode Holders, Starter and Relay Combinations, Special Controls and Panels.

Controls will never trouble you, when you buy B/W

B/W CONTROLLER CORPORATION

2224 East Maple Road, Birmingham, Michigan

FIRST IN THE FLOATLESS CONTROL FIELD

CARLON PLASTIC PIPE BREAKS INSTALLATION TIME RECORDS
CARLON PIPE NOW USED FOR WATER SERVICE LINES
New CARLON Lightweight Plastic Pipe is Easier to Install and Lasts Longer
CARLON GUARANTEED AGAINST ROT, RUST AND ELECTROLYTIC ACTION
CARLON ACCLAIMED NEW PIPING ACHIEVEMENT
Stresses Need of Low-Cost Public Housing

GUARANTEED FOREVER...

. . . AGAINST ROT, RUST AND ELECTROLYTIC CORROSION!

CARLON plastic pipe is impervious to the enemies of metallic pipe . . . lasts far longer without maintenance. **CARLON** has the best flow characteristics of any pipe available today, and because it will never accumulate scale or sediment, flow rate remains constant for the life of the pipe.

CARLON is lightweight (only 1/8th as heavy as steel) . . . one man can install it without rigging equipment or special tools. This flexible pipe is supplied in long lengths (up to 400 feet) which follow irregular ditch lines and uneven ground surfaces. Because of these long lengths and flexibility, **CARLON** can be installed with far fewer fittings than rigid metal pipe.

Absolutely leak-proof joints can be made quickly with **CARLON** plastic pipe fittings. Flexible **CARLON** absorbs vibration stresses without developing leaks at the couplings. Install it and forget it!

WRITE TODAY FOR CATALOGS.

1944 CP

Every foot of **CARLON** is factory-tested at greater-than-working pressures for more than 8 hours.

CARLON CP

Buy the Pipe with the Stripe!

CARLON PRODUCTS CORPORATION

Pioneers in Plastic Pipe

CANADA: Micro Plastics, Ltd., Acton, Ontario • EXPORT: H. E. Botzow, New York City

10300 MEECH AVENUE • CLEVELAND 5, OHIO

Need more facts about advertised products? Mail your Reader's Service card now.

To order these helpful booklets check the coupon on page 28.

Water Conditioning Data Book Offered To Engineers

259. All engineers and municipal officials concerned with water conditioning will want a copy of the greatly enlarged edition of the popular Permutit Data Book prepared by the Permutit Co., 330 West 42nd St., New York 36, N. Y. This completely revised book presents a compilation of 77 tables, all valuable to the engineer. Subjects include hydraulics, impurities in water, reactions and conversions of chemicals used in water treatment, alkalinity relationships and other helpful material.

Corrosion Protection For Water Works

280. Steel pipe lines, elevated tanks, treatment plant equipment and all other steel structures subject to rust, tuberculation and attack by aggressive soils can be protected by long-lasting Bitumastic enamels. Send for bulletins today so that you can specify the right coating for your job. Use coupon or write Koppers Co., Tar Products Div., Pittsburgh 19, Pa.

Helpful Valve Catalog For Engineers

236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 5002 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the coupon for your copy.

How to Make Fluoride Determinations

244. Information on the Hellige Aqua Tester for precise fluoridation control in the range from 0 to 1.6 ppm fluoride is available from Hellige, Inc., 877 Stewart Ave., Garden City, L. I., N. Y., by using coupon.

All-Electric Floatless Liquid Level Control

174. Description of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletin for engineering data, diagrams of typical installations and details of component parts. Check the coupon or write B/W Controller Corp., Dept. PW, Birmingham, Mich.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., 208 So. La Salle St., Chicago 3, Ill.

All About Centrifugal Pumps

258. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. PW, Chicago 5, Ill.

Heating, Thawing and Melting With Hauck Burner Equipment

277. A helpful 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. For a useful addition to your reference file, get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Burlington, N. J. Get your copy by checking the coupon.

Handy Catalog Covers All Pipe Repairs

290. A complete catalog covering repair clamps, packings and gaskets of several designs to suit all needs is offered by Smith-Blair, Inc., So. San Francisco, Calif. Directions for use show ease of application. Every water works needs a copy of this catalog for ready reference. Available by using the coupon.

Helpful Data On Valve Boxes

291. Bulletin 35 issued by Buffalo Pipe & Foundry Co., Box 55, Sta. B., Buffalo, N. Y. gives full details on adjustable valve boxes, extension boxes and roadway boxes for water and gas. Get your copy by checking the coupon.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

●

CONSTRUCTION EQUIPMENT AND MATERIALS

Blades For All Types Of Equipment

60. Get information now on long-wearing blades for graders, scrapers, bulldozers, snow plows and scoops; snow plow noses and runners; scarifier teeth and numerous other products for road machinery. Check coupon or write to Paper-Calmenson & Co., St Paul 8, Minn.

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through as-

...MEN AT WORK!

Beneath the surface of this undisturbed street in Washington, D. C. men are at work . . . reconditioning water pipelines with the Centriline process. Above ground, traffic flows smoothly . . . unobstructed by the usual men, machinery and excavations.

Because the Centriline process centrifugally applies cement-mortar lining to pipes in place, excavation time, overall costs and interruption to street traffic are kept at an absolute minimum. Couple these advantages with the fact that Centrilining permanently prevents corrosion and tuberculation, increases carrying capacity, reduces pumping costs, gives new pipe service at a fraction of the cost of new pipes, and you have the reason why more and more city engineers and officials are specifying Centriline for their pipeline projects.

CEMENT-MORTAR LININGS FOR PIPES IN POSITION

2,298,688 FEET OF EXPERIENCE

CENTRILINE CORPORATION

A subsidiary of Raymond Concrete Pile Company

140 CEDAR STREET, NEW YORK 6, N. Y.

Branch Offices in Principal Cities of United States and Latin America

ON THE WEST COAST, WRITE PIPE LININGS, INC., P. O. BOX 3428, TERMINAL ANNEX, LOS ANGELES, CALIFORNIA

phalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 10 feet behind tractor in 140° arc and to depth of 8 feet. For full details check the coupon. Sherman Products, Inc., Royal Oak, Mich.

Catalog Covers Complete Line of Adams Road Machinery

45. All machinery in the Adams line of road building and maintenance equipment is illustrated and described in an attractive catalog, Form 5110, issued by the J. D. Adams Mfg. Co., Indianapolis, Ind. Included are motor graders, self-propelled Traveloader, pull type graders and accessories. Check coupon for your copy of this comprehensive booklet.

Handbook of Contractors Pumps Is Easy to Use

49. Big 50-page Catalog P-10 covers dewatering pumps, pressure pumps, well point systems and electric pumps, and also features a special section of useful data which helps in the selection of the right pump for your job. Every construction engineer and contractor should have a copy of this valuable handbook. Just check the coupon. The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Examining a Tractor Piece by Piece

99. The 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-9 Diesel is considered separately. These piece by piece discussions are supplemented by notes on easy servicing, versatile applications and attachments for every need. Get your copy of form CR 313-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy coupon.

How to Choose the Right Self-Priming Centrifugal Pump

212. Descriptive folders on the complete line of contractors' pumps have been issued by the Gorman-Rupp Co., Mansfield, Ohio. 2-in. to 10-in. models are illustrated, performance tables are shown and pump selection tables are included to assist in choosing the proper pump for different jobs. Check coupon for your copies.

Trenching Made Easy With Hydraulic Dragshovel

216. The Bucyrus-Erie "Hydro-Hoe", a completely hydraulic dragshovel has two separate digging actions to dig a level, scallop-free trench and greatly reduce hand trimming. Be sure to investigate this rugged, easily operated machine. For details write Bucyrus-Erie, Hydrocrane Div., So. Milwaukee, Wis., or check the handy coupon.

Handbook of Castings For All Public Works Construction

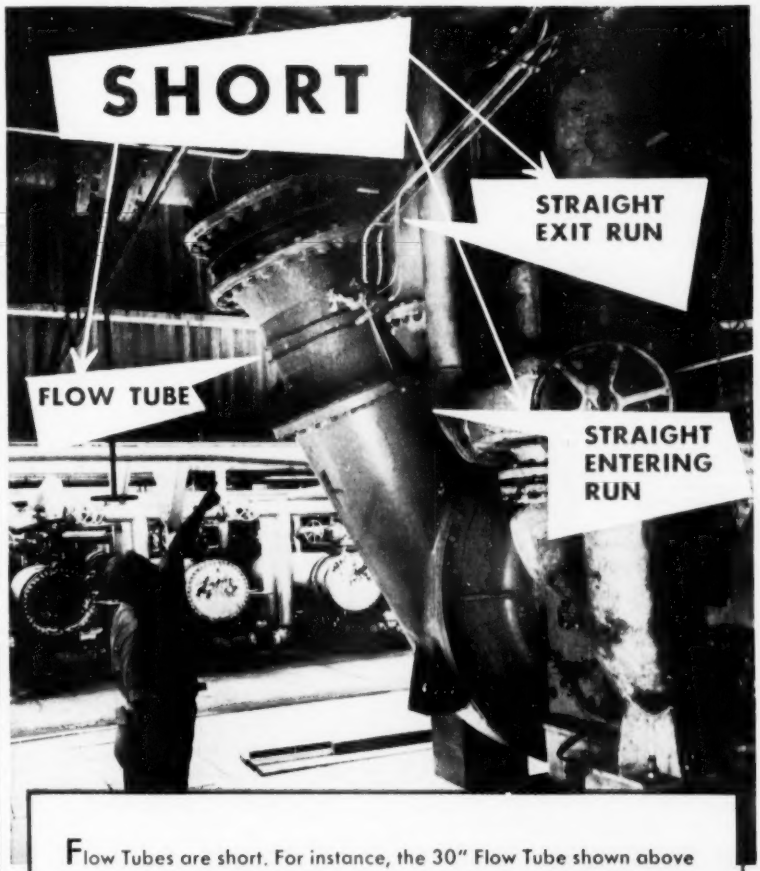
220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Get Tough Blades and Cutting Edges For Your Construction Equipment

221. Controlled analysis steels used in Shunk blades and cutting edges for graders, scrapers, dozers, and snow plows mean long life and wear resistance to give you more value for your maintenance dollar. Full data for ordering blades and scarifier teeth for standard and special equipment is available from Shunk Mfg. Co., Bucyrus, Ohio. Check the coupon today.

Profitable Construction with Payloader

234. A comprehensive, 12-page catalog filled with on-the-job photos showing a wide variety of earth-moving, material-handling, lifting and carrying jobs being performed by the multi-purpose tractor-shovels known as "Payloaders" is now available. Helpful job data, specifications and features of the complete Payloader line are included, with illustrations of useful accessories. Copies of this colorful catalog No. 217 can be obtained from The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Ill., or by checking the coupon.



Flow Tubes are short. For instance, the 30" Flow Tube shown above is only 30", face to face. And because they need only minimum straight runs entering and following, they can be installed at practically any accessible point where flow conditions are reasonably steady.

This important advantage means easy, convenient, economical installations.

Flow Tubes are manufactured exclusively by Foster Engineering Co. in all pipe sizes for measuring the flow of liquids and wet or dry gases. They can be furnished with or without suitable secondary indicating, recording or totalizing instruments, and, to insure maximum combined accuracy of primary element and receiver, each Flow Tube is furnished with an individual head capacity curve. For unusual piping arrangements, calibration curves for simulated conditions can be furnished.

For further information, ask for Bulletin FT-101; and for specific recommendations, please send us necessary flow data.

FOSTER AUTOMATIC VALVES

PRESSURE REGULATORS • RELIEF AND BACK PRESSURE VALVES • CUSHION CHECK VALVES • FAN ENGINE REGULATORS • PUMP GOVERNORS • TEMPERATURE REGULATORS • FLOAT AND LEVER BALANCED VALVES • NON-RETURN VALVES • VACUUM REGULATORS OR BREAKERS • STRAINERS • SIRENS • SAFETY VALVES • FLOW TUBES

FOSTER ENGINEERING COMPANY • UNION, N. J.

Get full details of this month's new products . . . mail your Readers' Service card today.

To order these helpful booklets check the coupon on page 28.

Inexpensive Ditcher Handles Heavy Digging

91. The Shawnee Scout Ditcher, a new, heavier model for extensive digging has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas. Just check the coupon.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Give Full Protection To Treated Poles and Timbers

267. Bolt holes in treated poles and timbers used for guard rails and structures can easily be the first point of decay. Now you can assure maximum life by using the Greenlee Bolt Hole Treater, a simple device that forces preservative into the wood cells. Bulletin 13-15 gives the details. Greenlee Bros. & Co., Rockford, Ill.

Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power of hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wisc.

Your Property is Worth Good Protection

176. When installing link fence you want protection against rust and corrosion as well as vandalism. Investigate chain link fence made of "Konik" metal described in "Planned Protection" published by Continental Steel Corp., Kokomo, Ind.

How to Dig Low Cost Trench Under All Conditions

61. The Barber-Greene Runabout ditcher features hydraulic control of crowding speed, independent of bucket line speed, to provide maximum digging efficiency under all soil conditions. One-man operation and mobility from job to job result in trenching at the lowest cost. Get Bulletin 705-A now for full details on this money-saving machine. Barber-Greene, Aurora, Ill.

Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

Details on Motor Grader Construction and Use

312. In a handsome catalog, profusely illustrated with diagrams and photographs of unusually fine quality, the Galion Iron Works and Mfg. Co., Galion, Ohio, has presented all details on the construction and operating features of their Model 118 motor grader. This impressive 28-page catalog, No. 375, is available without charge. Just check the coupon.

●

REFUSE COLLECTION AND DISPOSAL

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

How to Reduce Refuse Collection Costs

123. The sequence of operations for fast loading and refuse compaction in the Gar Wood Load-Packer are illustrated and described in 12-page folder W-110, together with size data and details of hydraulic elements. Be sure to check all details of the efficient Load-Packer system. Check coupon or write Gar Wood Industries, Wayne Division, Wayne, Mich.

●

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Enterprises, Inc., 8733 So. State St., Chicago, Ill., by using coupon.

●

BUSINESS AND ADMINISTRATION

What Bonded Performance Can Do For You

121. On every construction job your city or county should be protected from a contractor's default or inability to perform the work. Learn what "Bonded Performance" can do for you. Write National Surety Corp., 4 Albany St., New York, N. Y., or check the coupon for full details.

HELLIGE TURBIDIMETER

A TURBIDIMETER WITHOUT STAND

FOR TURBIDITY MEASUREMENTS, SULFATE DETERMINATIONS, AND SPECIAL APPLICATIONS

Modern in design and operating principle, the Hellige Turbidimeter does not require standard suspensions or long cumbersome tubes. Accurate readings can be made rapidly by those without technical training.

Precise determinations are performed in the ranges of zero to 150 p.p.m. SiO_2 and zero to 100 p.p.m. SO_4. Higher values are determined by diluting the specimen.

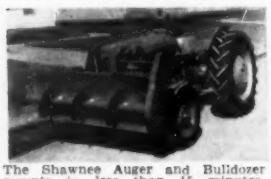
Send for Catalog No. 8000-A

HELLIGE Inc.

877 STEWART AVENUE, GARDEN CITY, L. I.

WINDROWS THE SNOW CLEANS IN ONE PASS!

A revolving "CYCLONE AUGER", powered by the tractor take-off, provides easier, faster side delivery of snow and other materials practically eliminating side draft.



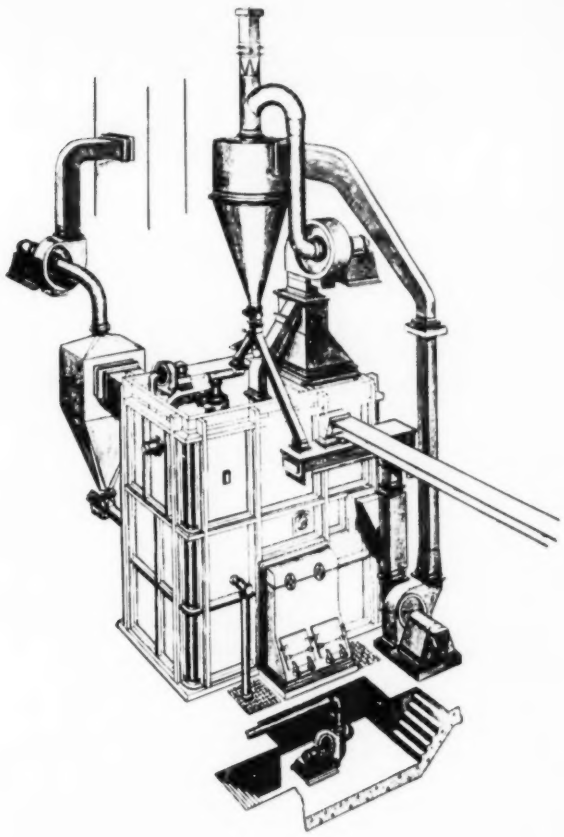
The Shawnee Auger and Bulldozer mounts in less than 15 minutes. Fits all Ford, Ford-Ferguson and Ferguson tractors.

The AUGER raises and lowers with the hydraulically controlled bulldozer, continually moving the material to the right, making the unit ideal for snow removal, on roads, streets, and general traffic areas.

For additional information, please write:

SHAWNEE MANUFACTURING COMPANY, INC.

1947 North Topeka Topeka, Kansas



The Ideal Solution to Sludge Disposal Problems

Here is the *modern method* of sludge disposal — the C-E Raymond System of Flash Drying and Incineration. Continuously, automatically, this system incinerates thickened sludge to a fine ash, free from clinker and unburned materials... or flash dries it to fertilizer, containing all of the original fertilizer constituents.

C-E systems now in service are meeting the requirements of both large and small communities — serving equivalent populations from 6,000 to 3,600,000. The list below shows the most recent installations.

C-E Raymond Systems installed, under construction or on order since 1945

Installation	Consulting Engineer
Baltimore, Md.	Whitman, Requardt & Associates
Bethlehem, Pa.	Morris Knowles
Bloomsburg, Pa.	Gannet, Fleming, Corddry & Capper
Camden, N. J.	Havens & Emerson
Chicago, Ill. (W. Southwest)	City Engineering Dept.
Fond du Lac, Wis.	Jerry Donohue Engrg. Co.
Houston, Texas	Greeley and Hansen
Lansing, Mich.	Drury, McNamee and Porter
Los Angeles, Cal.	Metcalf and Eddy
San Diego, Cal.	Frank Currie
San Francisco, Cal.	Clyde C. Kennedy
Schenectady, N. Y.	Havens and Emerson
Sheboygan, Wis.	Jerry Donohue Engrg. Co.
Washington, D. C.	Greeley and Hansen
Waterbury, Conn.	Malcolm Pirnie
Wyomissing Valley, Pa.	Albright & Friel
York, Pa.	Albright & Friel

C-E Raymond Systems are flexible in layout, highly efficient and fully reliable; they provide for maximum utilization of waste heat. They mean for any community the end of stream or atmospheric pollution resulting from the disposal of sewage wastes.

The services of C-E specialists are available to help you plan for the most practical and economical answer to your sludge disposal problems. For prompt attention, get in touch with one of the Combustion offices listed below.

Industrial sludges a problem?
C-E Raymond Flash Drying and Incineration Systems have been the answer for others. Write for information.

B-586

COMBUSTION ENGINEERING—SUPERHEATER, INC.

FLASH DRYER DIVISION

1315 North Branch Street
Chicago 22, Illinois

Western Office: 560 W. Sixth, Los Angeles 14, Calif.
Eastern Office: 200 Madison Ave., N. Y. 16, N. Y.

Now's the time to mail this month's Readers' Service card.

Guns Concrete Faster, Easier... Makes Profits or Savings Bigger-

the New **BONDACTOR** Model # 1250

NOW . . another new BONDACTOR . . the Model #1250, incorporating all the advantages of earlier BONDACT Process Equipment plus many new features. Guns everything from heaviest chrome-type refractories to lightest-weight insulating concretes and Vermiculite concrete. New, exclusive air recovery system provides more efficient use of air. New, heavier 3 h.p. rotary air motor assures steady, continuous operation with all materials and aggregates. New, improved metering and shut-off valve permits easier, better control of material flow. New upper material valve assembly has new valve cone that makes a more positive seal, is easily cleaned.

JUST ONE OF HUNDREDS OF USES FOR THE **BONDACTOR**

The BONDACTOR performing a quick, strong repair job on the concrete base of a steel girder bridge.

See Your Construction Equipment Distributor, or Mail Coupon Today for Free Literature

AIR PLACEMENT EQUIPMENT COMPANY
1013 West 24th Street Kansas City 8, Missouri

Send information on New Model #1250 Bondactor. I am considering using the Bondactor for

_____

Name _____

Firm _____

Address _____

City _____ **State** _____

DON'T BUILD ANY POOLS

until you have secured the latest information from

Josam

If you are charged with any responsibility for construction or maintenance of swimming pools in your community, then by all means you should write Josam for information on how to insure and maintain proper health standards, safety and hygenic conditions for bathers. Also how to provide a constant supply of clean water and how to secure maximum service from your pools *before* you start construction.

"DOUBLE RECIRCULATION" TYPE POOLS

Josam offers complete information on recirculating type pools which provide double recirculation of water in a pool by water being drawn from the pool through the outlet drains, sterilized, filtered and returned through the Injector Supply at the same time that the water from the pool which enters the recirculating fittings at the bottom of the pool wall, is drawn through the line to the injector supply.

WATER LEVEL DECK POOLS

This new type of pool differs in construction and operation from the conventional side wall gutter pool. One of the most significant changes from the conventionally designed pool is the relocation of the overflow from the vertical side wall to a horizontal set back position under a slotted grille in the deck surrounding the pool.

This change permits the water in the pool to be maintained at approximately the same level as the surrounding decks and eliminates the use of steps and ladders . . . hence the name "Water Level Deck Swimming Pool."

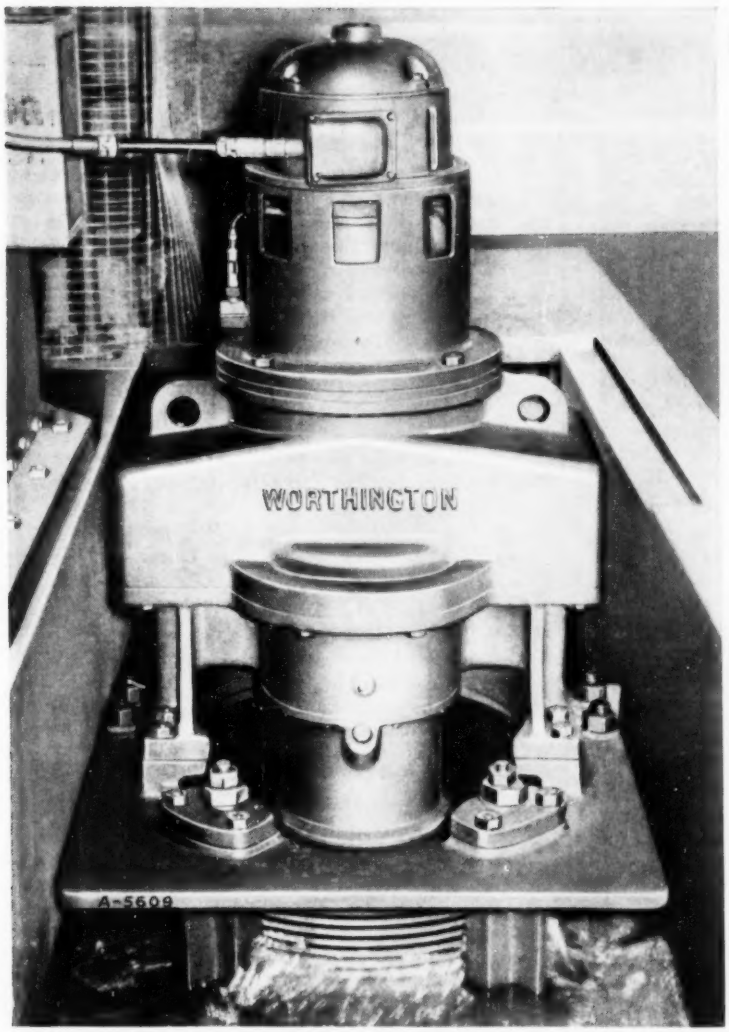
Write today for complete information on Swimming Pool Design and Fittings.

JOSAM MANUFACTURING CO.
Michigan City, Indiana

JOSAM MANUFACTURING CO.
Dept. PW, Michigan City, Ind.
Please send complete information on:
☐ Recirculating Type Pools ☐ Water Level Deck Pools

NAME ..... PROFESSION .....
FIRM .....
ADDRESS .....
City ..... Zone ..... State .....

Worthington comminutor replaces mechanically raked screen at Camp Kilmer



WORTHINGTON 25C6 COMMINUTOR installed in existing 3 ft. wide by-pass channel at Camp Kilmer, N. J. The average daily flow is 3.5 million gallons. Maximum daily flow is 7 million gallons. Sanitary Engineer is C. J. Shepherd.

Comminutor installed in existing channel in five hours

During recent improvements in the sewage treatment plant at Camp Kilmer, New Jersey, a Worthington 25C6 comminutor was installed in an existing by-pass channel.

The comminutor, set up and operating in five hours, replaced a bulky, mechanically raked screen which required separate handling and disposal of sewage solids.

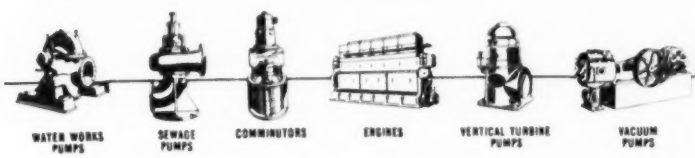
Refuse and sewage solids are now treated by a compact screening and comminuting mechanism which eliminates the health hazard caused by separate handling of solids.

Engineers everywhere recommend the completely automatic Worthington comminutor because:

- It can be readily installed in new or existing straight-flow rectangular channels.
- Cutter-racks are quickly removable for sharpening or replacement.
- It may be flooded without damage because of mercury-seal protection.

Let us work with you on your community's screening problem—or any other engineering problems involving sewage, water works, or municipal power generation. Write to Worthington Corporation, Public Works Division, Harrison, N. J.

W.2.6



All Major Public Works Equipment Under One Responsibility

WORTHINGTON

Public Works Equipment

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

ACE FACTS!

REPORT FROM MUNICIPAL AND INDUSTRIAL OFFICIALS

SAVE ". . . amazed to find pipe cleaning only ½ expected cost."

SERVICE "Your prompt action with mobilized equipment highly commendable." Anywhere, anytime.

SURE ". . . happy to say pipe efficiency restored to 100% effectiveness."

Call Collect, Write, Wire for Free Information or Estimates on Your Sewer or Water Main Problems. No Obligation!

The ACE-method fits every pipe-cleaning budget! No expensive equipment to purchase or maintain. Lower underwriters' fire insurance rates. No repeated service calls by maintenance crews. Plant pumping costs reduced.

Facts prove old pipe should be rehabilitated before adding new extensions.

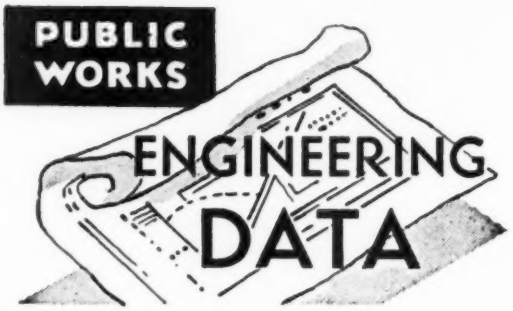
The famous ACE-method effectively cleans water and sewer pipes with modern equipment and technical "know-how" teamed with vast experience. Let ACE show you! Write for our 21-minute sound movie showing ACE crews in action.

WRITE TODAY FOR THE FREE ILLUSTRATED FACTS!

ACE PIPE CLEANING CONTRACTORS, INC.

Sewer & Water Pipe Specialists
HOME OFFICE
3513 East 18th St. Kansas City, Mo.
Phone CHestnut 2891
Offices in Principal Cities

Originators of the ACE-method.



Cathodic Protection Prevents Corrosion of Deep Well Equipment

A case history of the use of cathodic protection for preventing corrosion of deep well equipment was reported in "Chlorination Topics" of Wallace & Tiernan Co. The column pipe in a deep well, set in 1944, had to be replaced in two and a half years, due to corrosion and pitting. This replacement also failed in less than three years. It was proposed that bronze be used in place of steel at an extra cost of $2500. Electro Rust-Proofing Corp. recommended instead that steel be used and that cathodic protection be installed. The cost of cathodic protection was less than half that of using bronze parts. After some three years of service, the pipe was pulled for inspection and was found to be in practically its original condition, with no sign of corrosion or pitting.

• • •

Performance of Diesel Engine Driven Centrifugal Pump

A diesel engine driven DeLaval centrifugal pump was operated by the New Bedford, Mass., Water Board, all or parts of 72 days for a total of 512 hours and 45 minutes. The number of gallons of diesel fuel required to raise one million gallons 100 ft average 27.7, and the cost of this fuel was $2.92.

• • •

Variations in Daily Water Consumption in New Bedford

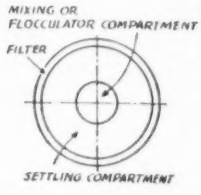
The annual report of the Water Board of New Bedford, Mass., covering the year 1951, shows the maximum consumption of water for 24 hours to have occurred on July 26, consumption being 22,864,500 gals. Minimum consumption was Nov. 18, and amounted to 10,031,500 gals. Average daily consumption, 6 AM to 6 PM was 10,285,725 gals., and average night consumption, 6 PM to 6 AM was 7,324,916 gals.

• • •

Detail Costs of Garbage, Rubbish and Ash Collection

In its most recent annual report, the city of Easton, Pa., states the costs of collecting garbage, rubbish and ashes, to be: For garbage and rubbish, per ton —labor for collecting, $7.37; for trucks, $0.4264; for handling at the incinerator, $1.7416; for fuel, $0.04555; for supervision, $0.3037; and for maintenance and operation, $0.1643. For ashes, per load costs were—for labor per load for collecting, $4.175; trucks per load for collecting, $0.3849; and supervision per load, $0.313. In 1951, 6,991 tons of garbage and refuse were collected and 6,873 tons of ashes.

Information courtesy Mr. E. H. Aldrich, Chief Engineer, American Water Works Service Co., Phila., Pa.



There are four purification units like this at Chattanooga with a rated capacity of 2.5 mgd each, capable of operating at twice this capacity. These are an addition to the existing plant of 32 mgd capacity.

Two years ago, this entirely new design developed by American Water Works Service Company was installed in Alexandria, Va. Instead of the conventional layout, with separate structures for mixing, settling, etc., this plant has "*purification units.*" Each unit incorporates all the major purification operations . . . i.e. after the raw water is chemically treated, it receives the usual mixing, coagulating, settling, and filtering, all in the same steel tank (see drawing).

The success of the plant has led to two new installations—Chattanooga, Tenn., and Westmoreland County, Pa. Like Alexandria, both these plants cost far less to build than comparable units of conventional design. All three plants have proved to be easy and economical to operate, and highly flexible.

The porous underdrains used in all these purification units are ALOXITE aluminum oxide plates. These should contribute materially to continued low operating and maintenance costs.

May we send you our popular booklet on porous media? It's 56 pages cover all fields of filtration and diffusion. It gives pointers on specifying materials; outlines how to install, operate and maintain various units. Complete with photos, charts, etc.

Use porous plates and diffusers by

CARBORUNDUM

Trade Mark

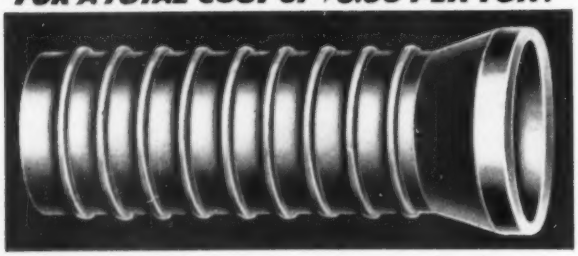
Dept. W-23, Refractories Division — The Carborundum Company, Perth Amboy, N. J.

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company.

Get full details of this month's new products . . . mail your Readers' Service card today.

Make this pipe in 30 seconds

FOR A TOTAL COST OF $6.00 PER TON!



McCracken Machines make 4" to 36" concrete pipe, plain or steel reinforced, with both tongue and groove or bell and spigot joints. For use in farm drainage, road culvert, and sewer (both storm and sanitary) systems.
McCracken's unmatched production speed, quality of pipe, and economy of operation gives you the big edge over competition and means bigger profits on every job. Write for complete details, to Dept. P W J at any of the following addresses:

Harry E. Amar: 211 East 149th St., New York 51, N. Y.

CONCRETE PIPE MACHINERY CO.
SIOUX CITY, IOWA

Geo. N. Hoffman: Apartado Postal 1173, Mexico D. F.

drill
5 to 7 times more holes in concrete

tilden
ROTARY KONKRETE KORE DRILLS

You can drill straight, clean, ready-to-use holes at speeds up to 6 inches per minute—even through steel reinforced concrete. Cuts 5 to 7 times more holes than competitive drills. Special diamond-ground, sintered carbide cutters drill up to 1,000 inches of concrete without resharpening. TILDEN factory precision resharpening is FREE! 29 standard sizes—$^{3}/_{16}$" to 4" dia.—interchangeable shanks up to 60".

PATENTED CORE SLOT EXPELS CUTTINGS AUTOMATICALLY!

WRITE TODAY for free, illustrated catalog.

U.S. Pat. No. 2506474

SOLD BY SUPPLY HOUSES EVERYWHERE

TILDEN TOOL Manufacturing Company
209 Los Molinos • San Clemente, Calif.
Branch Offices:
1144 W. Washington Blvd. Chicago 7, Illinois
1995 N. Fair Oaks Avenue Pasadena 3, Calif.

Now's the time to mail this month's Readers' Service card.

Sewage Treatment Plant Operating Experiences Odor Control and Digester Cleaning

Preventing Odors from Imhoff Tank.—At Calmi, Ill., odors from the Imhoff tanks, thought to be due to septic sewage, were only partly eliminated by use of Chloroben. The operator tried putting recirculated filter effluent into the tank and reported that this and small amounts of Chloroben applied at the wet well have just about eliminated the odors.

Aids For Overloaded Plant.—The treatment plant at Oak Lawn, Ill., is overloaded and scheduled for eventual abandonment. Meantime the digester is being heated by injecting steam into the discharge end of the sludge pump; compressed air is used to supplement the mechanical aerators, and to keep the aeration tanks free from frothing; all activated sludge is returned and the suspended solids are maintained at 800 ppm or higher. Lagoons are used instead of sludge beds.

Cleaning a Digester.—Walter A. Sperry, Supt. of the Aurora, Ill., Sanitary District, has cleaned his primary digester three times in seventeen years and offers the following suggestions based on this experience. Discharge onto drying beds or a lagoon all of the contents that will flow by gravity. Remove the gas dome, place a large fan over the opening, and open the inspection manhole; this keeps a draft through the digester. For lighting, use a safety lamp and all-rubber extension cords. Test air for safety; permit no smoking or matches. Pump out the remaining pumpable material, keeping the end of the suction hose flushed with a 2-inch water stream playing in the sludge near it. For this purpose, use a diaphragm-type pump with flap valves. If ball valves are used, it is necessary to stop the pump frequently to remove sticks, leaves, etc. Finally, hand cleaning is necessary, men wearing boots flushing, pushing or squeegeeing the remaining material toward the suction inlet; flushing is probably the best method. Examine and clean the heating coils, cracking off any scale found on them.

These items are from *The Digester*, a quarterly issued by the Illinois Division of Sanitary Engineering.

• • •

Use CO_2 for Repairing Gasoline Containers Safely

All repair shops are called upon to repair or weld gasoline tanks on motor vehicles. Some attempt has also been made to weld or repair gasoline service station tanks which have developed leaks.

Many have the mistaken idea that flushing these tanks with water will make them safe to work on. Such rinsing is seldom sufficient, and there have been many cases of violent ruptures of the tanks. Steaming the tanks is a little better, but does not assure safety.

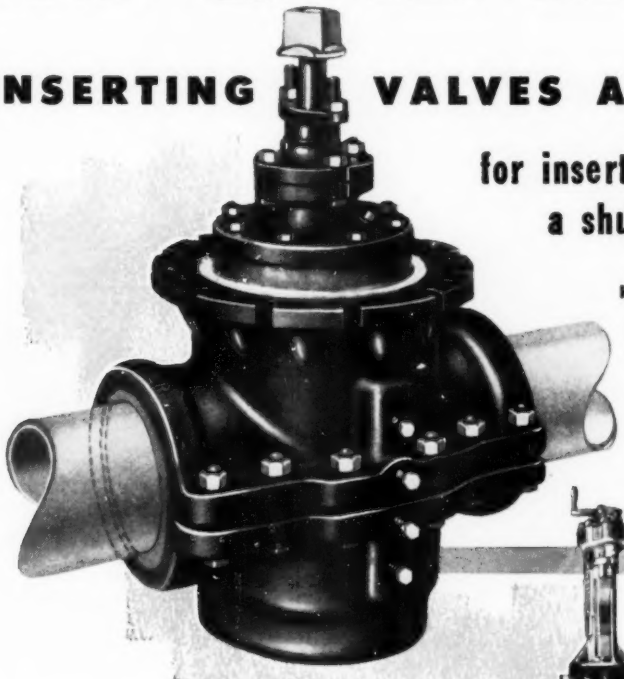
The most desirable means is to empty the tank, and then dilute the residual vapors with an inert gas. Carbon dioxide, either in the form of dry ice or as a discharge from a carbon dioxide extinguisher can be used.

A pound or so of dry ice or carbon dioxide should be sufficient for a tank of from 100 to 115 gallons capacity. This amount is computed on the basis of producing a mixture where 50% is carbon dioxide vapor—National Safety Council.

MUELLER

INSERTING VALVES AND EQUIPMENT

for inserting control valves where a shutdown is impractical



H-800 INSERTING VALVE

New smaller valve sleeve permits fast, easy installation in minimum space. Valve mechanism is the same as standard Mueller gate valve (repair parts interchangeable). Sizes 4", 6", and 8" (sizes of valves correspond to size of main).

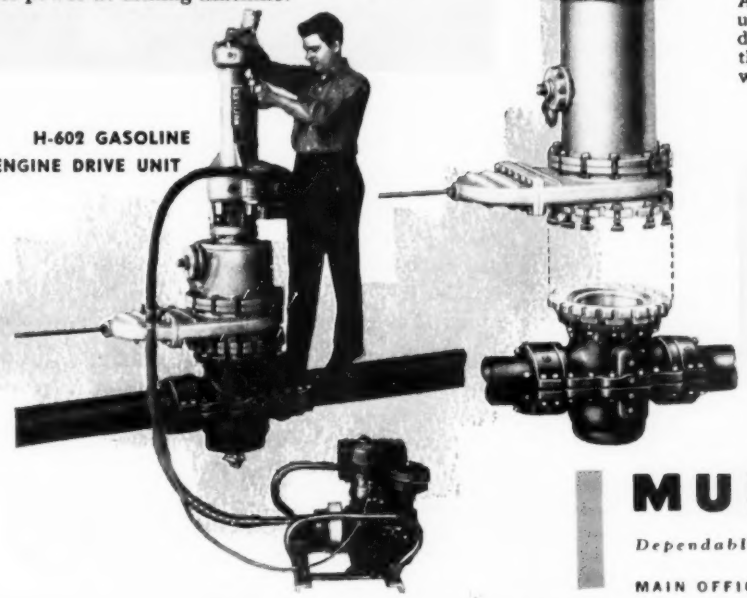
DRILLING MACHINE

The C-C hand-operated or C-1 power-operated machine may be used for both drilling the main and inserting the valve plug. The C-1 machine may be operated either by the H-660 Air Motor or the new H-602 Gasoline Engine Drive Unit.

This new portable unit may be used to power the C-1 drilling machine. Compact and easily handled, this power unit can be used on many jobs. Its' ten-foot flexible drive shaft allows unrestricted movement. Remote control throttle permits full control of power at drilling machine.

H-810 BASIC INSERTING EQUIPMENT

An assembly of pressure confining units plus a slide valve. Permits the drilling of the main and inserting of the valve plug, easily and safely, with no water loss.



H-602 GASOLINE ENGINE DRIVE UNIT

Write for Catalog H-20 and H-602. Complete illustrated instruction manuals and parts list shipped with equipment.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

"Our Country's Strength is Created . . ."

REESE H. TAYLOR
President, Union Oil Company of California

"Our country's strength is created by the responsibility and solidarity of individual citizens in a self-chosen government and economy. It can—and must—be perpetuated against all who seek to undermine it. The men and women who invest regularly in United States Defense Bonds are contributing to our national integrity and to the traditions of personal independence so characteristic of a free people."

Every pay day, 6,500,000 employed men and women . . . "are contributing to our national integrity and to the tradition of personal independence . . ." by the systematic purchase of United States Defense Bonds.

How important is this contribution to national economy and personal security? Let's look at a few figures.

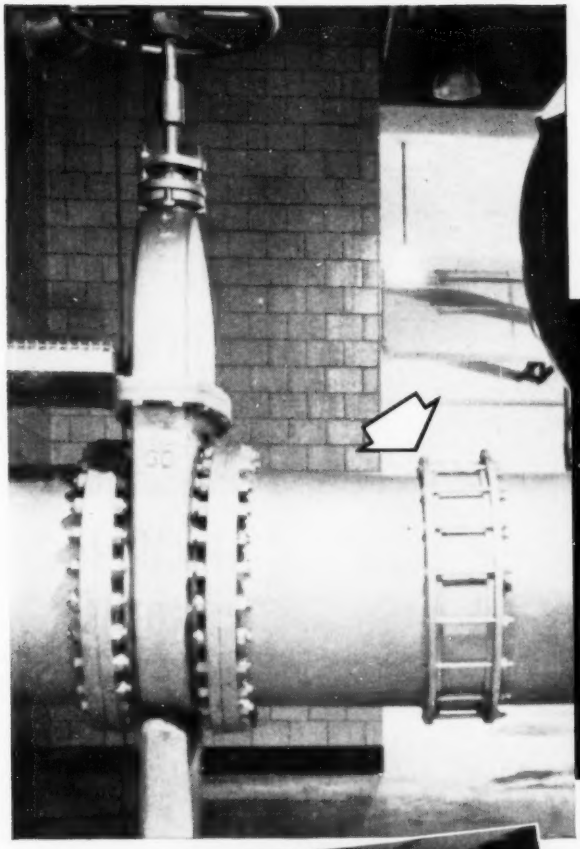
- the cumulative purchases of 6,500,000 Payroll Savers add up to $130,000,000 per month.
- the number of individual E Bonds sold in 1951 totaled 63,069,000 pieces—8% more than in 1950.
- purchases of $25 and $50 E Bonds—the denominations popular with Payroll Savers—were greater than the sales of $500 and $1,000 E Bonds.
- monthly redemptions of unmatured E Bonds during each of 9 months (April to December, 1951) were less than 1% of the amounts outstanding.
- the *cash value* of Series E Bonds held by individuals on December 31, 1951, amounted to $34,727,000,000—$4.8 billions more than the cash value of Series E's outstanding in August, 1945.

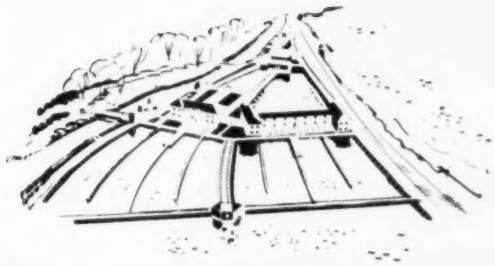
That Americans have built personal security and a reservoir of purchasing power exceeding $34.7 billions is due in no small measure to the patriotism and foresight of men like Mr. Taylor and other leaders of industry who have made the Payroll Savings Plan available to their employees.

For help with your Payroll Savings Plan, phone, wire or write to Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Building, Washington, D. C.

The U.S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.





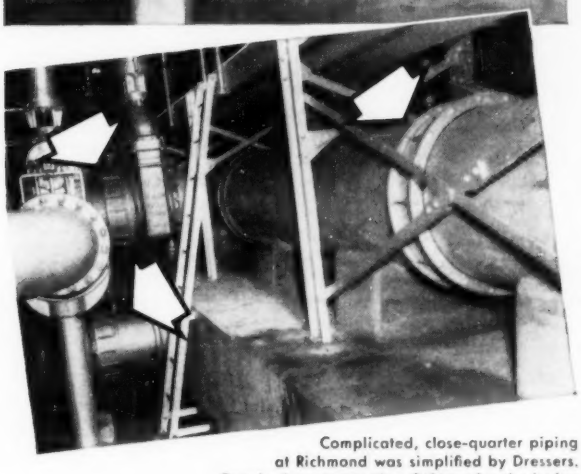
at Richmond, Virginia...

DRESSER COUPLINGS *Safeguard Big Valves*

Marsden C. Smith, Richmond's Chief Water Engineer, writing in *Water & Sewage Works*, says, "The design of the large valves controlling the filters in our No. 2 Purification Plant has been greatly improved by the use of 'plain ends' connected by flexible couplings. This eliminates dangerous stresses on the valve bodies, due to expansion and contraction, and also provides a simple means of replacing the valve, or its removal for repairs."

Dresser Couplings make big-pipe installations easier, faster . . . even in close, cramped quarters. Dressers can give or take as much as 3/8", deflect as much as 4° or more.

Dresser Couplings eliminate expensive maintenance . . . assure lifelong dependability.



Complicated, close-quarter piping at Richmond was simplified by Dressers. Required no exact pipe fitting, absorbed pipe movement without leakage.

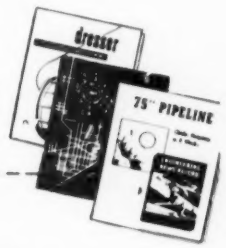
DRESSER®

COUPLINGS

Dresser Manufacturing Division,
Bradford, Pennsylvania
(One of the Dresser Industries)

FREE ENGINEERING DATA

Let us send you Dresser engineering installation reports, with facts and figures that may help you. Mail the coupon below.



DRESSER MANUFACTURING DIVISION
59 Fisher Ave., Bradford, Pa.

Gentlemen:

Please send me your engineering reports on recent Dresser Coupling installations.

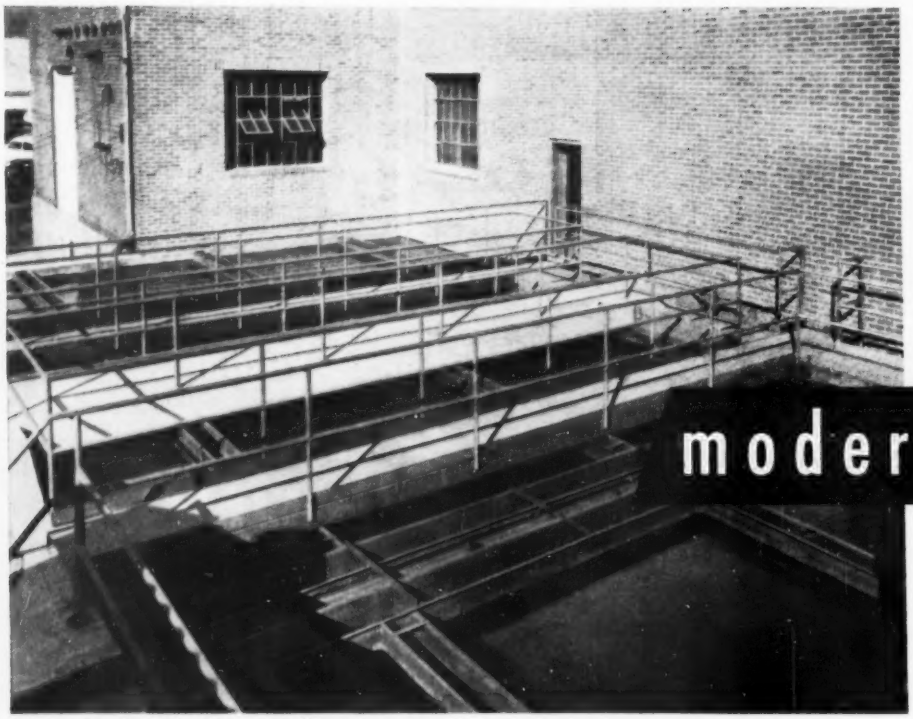
Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____



HOW NORTH KANSAS CITY modernized ITS IRON REMOVAL PLANT

Photo courtesy City of North Kansas City, Missouri

TO *triple* the 1912 rate of an old-fashioned settling basin and two filters could be a problem—and quite expensive.

Consulting Engineer Charles A. Haskins, solved it very economically. Two compact, modern Permutit Precipitators were built into the *old* settling basin. Operating on the highly efficient sludge-blanket principle, these Permutit Precipitators assure maximum operating economy.

The results of this modernization—detailed in the table below—speak for themselves:

- Total Iron reduced from 5.0 to 0.1 ppm.
- Manganese reduced from 0.2 ppm to essentially zero.
- Turbidity reduced from 50 to only 3 ppm—permits 19 hour per day filter runs with washing only once every 5 days!
- Hardness reduced to level desired.

For full details on the Precipitator write to THE PERMUTIT COMPANY, Dept. PW-2, 330 West 42 St., New York 36, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance St., Montreal.

Water Analysis Report Before and After Conditioning

		PPM as	Raw Water from wells before aeration	Precipitator effluent (unfiltered)
CATIONS	Calcium (Ca++)	$CaCO_3$	145	55
	Magnesium (Mg++)	$CaCO_3$	103	75
	Sodium (Na+)	$CaCO_3$	108	105
ANIONS	Bicarbonate (Alkalinity) (HCO_3—)	$CaCO_3$	190	42
	Carbonate (Alkalinity) (CO_3——)	$CaCO_3$	0	24
	Hydroxide (Alkalinity) (OH—)	$CaCO_3$	0	0
	Chloride (Cl—)	$CaCO_3$	35	35
	Sulfate (SO_4——)	$CaCO_3$	146	139
	Total Hardness	$CaCO_3$	248	130
	Alkalinity A (Methyl Orange)	$CaCO_3$	190	66
	Alkalinity B (Phenolphthalein)	$CaCO_3$	0	12
	Free Carbon Dioxide	CO_2	16	0
	IRON (total)	Fe	5.0	0.1
	Silica	SiO_2	16.8	13.0
	MANGANESE	Mn	0.2	0.0
	TURBIDITY (after shaking)		50	3
	Fluorides	F	0.5	0.4
	Color		Turbid	5
	pH		7.3	9.5
	Total Hardness (as $CaCO_3$)	Result in grains per U.S. Gal.	15	7.6

WATER CONDITIONING HEADQUARTERS FOR OVER 40 YEARS...

PERMUTIT®

Thousands use our Readers' Service card to keep up to date . . . do you?

LET'S LOOK AT THE RECORD!

New York Chicago Philadelphia Los Angeles Buffalo
Cleveland Boston Milwaukee New Orleans Baltimore
Seattle Newark Indianapolis Denver Columbus San Diego Erie
Providence Richmond Norfolk Hartford Wichita Tacoma Albany
El Paso Scranton Knoxville Duluth Utica Lynn, Mass. Harrisburg, Pa.
Marin County, Cal. Burbank, Cal. Portland, Me. New Britain, Conn.
Bethlehem, Pa. Clifton, N. J. Alexandria, Va. New Rochelle, N. Y. Bloomfield, N. J. Meriden, Conn.
Haverhill, Mass. White Plains, N.Y. W. Hartford, Conn. Fargo, N. D. Newburgh, N.Y. Stratford, Conn.
W. Orange, N. J. E. Hartford, Conn. N. Tonawanda, N.Y. Fair Lawn, N. J. Danbury, Conn.
So. San Francisco, Cal. Portsmouth, N.H. Shorewood, Wisc. Harrison, N.J. Lakewood, N. J.
Winchester, Mass. Plantsville, Conn. Arlington, Ver. Atlantic City, N. J. Alameda, Cal. Woodbridge N. J.
San Raphael, Cal. Perth Amboy, N. J. Owosso, Mich. Larchmont, N. Y. Tor onto, O. Caldwell, N. J. Pittsfield, Mass.
Springfield, O. Camden, N. J. New Bedford, Mass. Patterson, N. J. Oneida, N.Y, Fitchburgh, Mass. Hillsboro, Cal. Cocoa, Fla.
Gloucester, N.J. Ft. Crook, Neb. Lansdale, Pa. Somers, N.Y. Hudson Falls, N.Y. York, Pa.
Simsbury, Conn. Plainfield, N. J. Fairfax, Va. Union, N. J. North Adams, Mass. Tonis Berlin,
Conn. Milford, Conn. Pearl River, N.Y. So. Windsor, Conn. Osw[illegible] N.Y. Ravenna, Ohio Brielle, N. J.
Coatesville, Pa. Meridian, Miss. San Mateo, Cal. Petersburg[illegible] Wilmington, N. C. Newport, R. I.
Birmingham, Mich. Wildwood, N. J. Weymo[illegible]Mass W. Sr[illegible]ld, Mass. Dunellen, N. J.
Westminster, Md. Brookli[illegible] st [illegible]tsc. Belmont, Cal. Kutztown, Pa.

are protected with complete or partially-complete CD Warning Systems

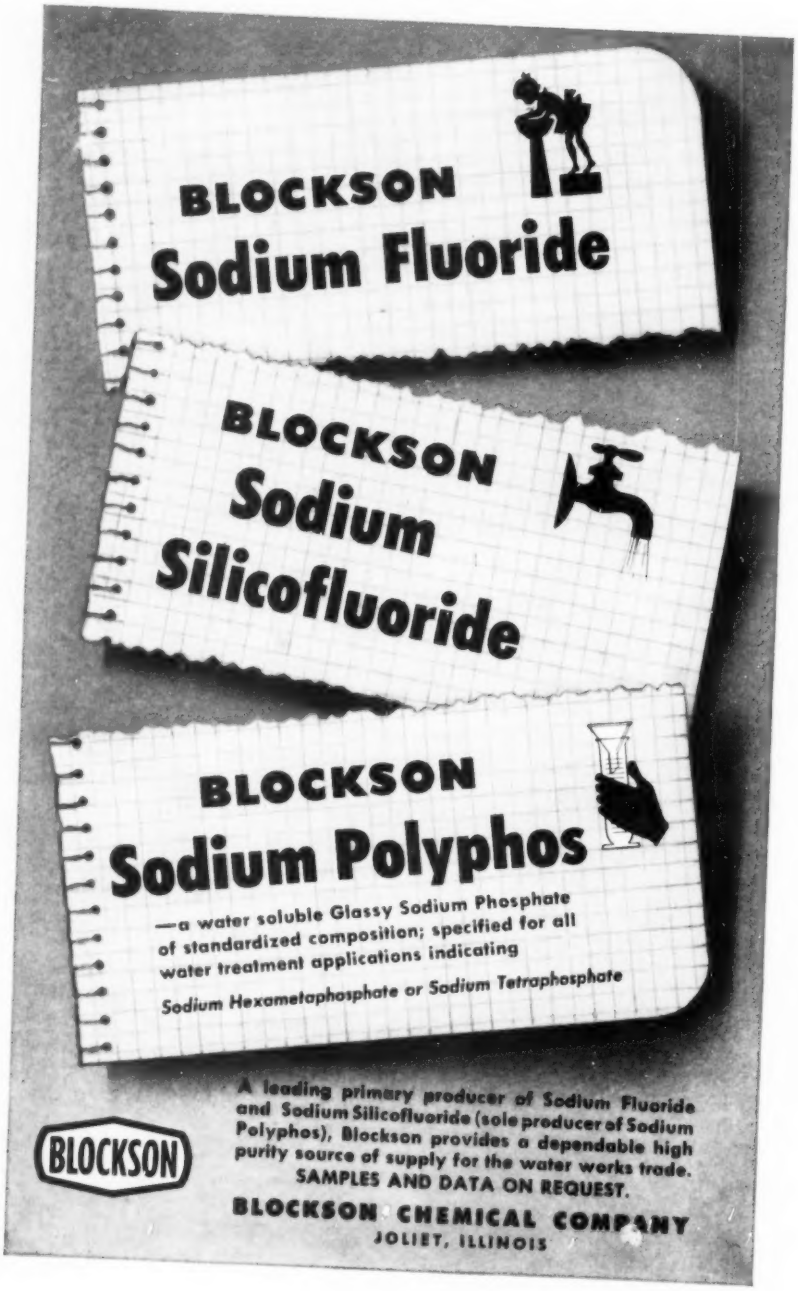
Federal Air Raid Sirens!

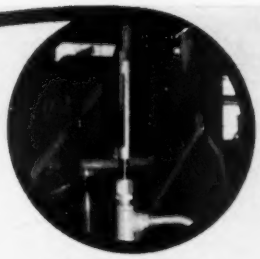
More and more cities every day are being added to this list of cities that have chosen Federal Air Raid Warning Systems for complete coverage.
Like overseas cities that experienced actual attack in World War II, they have learned that the best warning system is the Federal BALANCED system of various-sized signals, strategically located. They know that a few "super" signal devices CANNOT economically give overall protection like the Federal combination of large and small signals, custom engineered for each community.
Whatever your NEED, Federal has the system and the signals to fit that need. There is no easy "one-shot" way, but there is a better way. Call Federal and see!

Write for Bulletin 97 on Air Raid Sirens

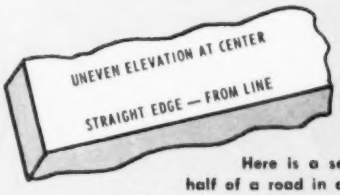
FEDERAL ENTERPRISES, Inc.
Formerly: Federal Electric Company, Inc.
8733 SOUTH STATE STREET CHICAGO 19, ILLINOIS

Now's the time to mail this month's Readers' Service card.


BLOCKSON
Sodium Fluoride
BLOCKSON
Sodium
Silicofluoride
BLOCKSON
Sodium Polyphos
—a water soluble Glassy Sodium Phosphate of standardized composition; specified for all water treatment applications indicating
Sodium Hexametaphosphate or Sodium Tetraphosphate
A leading primary producer of Sodium Fluoride and Sodium Silicofluoride (sole producer of Sodium Polyphos), Blockson provides a dependable high purity source of supply for the water works trade.
SAMPLES AND DATA ON REQUEST.
BLOCKSON
BLOCKSON CHEMICAL COMPANY
JOLIET, ILLINOIS



The Fluid Tells You The Course Is Level



Here is a section of half of a road in diagram. The outside edge has been laid by using a line. The edge at the center will assume the irregularities of the subgrade.

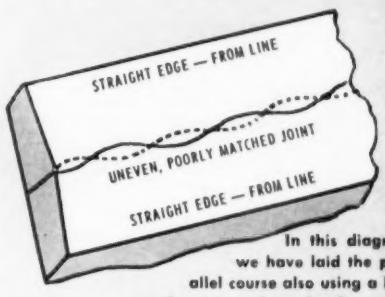
A job no other BLACK TOP PAVER can do!

THE increased use of asphalt on high-speed highway must tend toward better construction, greater smoothness and tighter, safer joints.

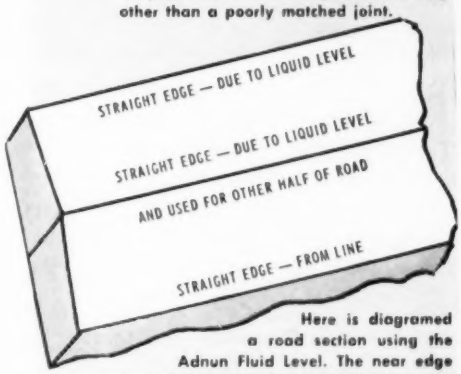
Continuous Course Correction, an Adnun feature, has always made Adnun laid roads smoother and the overlapping action of the Adnun Cutter Bar has always assured compact joints.

Now Adnun makes it possible to maintain absolute alignment of the course at the longitudinal joints with a perfect match regardless of the subgrade. The Adnun Fluid Level gives you scientific control of your road surface as it's laid. Your operator just watches the glass—the fluid tells him the course is level. The Fluid Level brings you the same ease of control as a carpenter level brings the carpenter. Study the diagrams at the right. They tell you the story.

Highway officials will find the Fluid Level a great asset to improving their roads. Insist that it be standard equipment on the pavers used in your State or County.



In this diagram we have laid the parallel course also using a line at the outer edge. As the center edge will also follow irregularities of the subgrade there is no hope for anything other than a poorly matched joint.


STRAIGHT EDGE — DUE TO LIQUID LEVEL
STRAIGHT EDGE — DUE TO LIQUID LEVEL
AND USED FOR OTHER HALF OF ROAD
STRAIGHT EDGE — FROM LINE

Here is diagramed a road section using the Adnun Fluid Level. The near edge is straight due to following the line. The center joint is true and matched true and the far edge is straight due to the Fluid Level.

ADNUN TRADE MARK REGISTERED **BLACK TOP PAVER**

BLAW-KNOX COMPANY
FOOTE CONSTRUCTION EQUIPMENT DIVISION
1954 STATE STREET NUNDA, NEW YORK

BLAW-KNOX

A

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

The "Lifesaver" of Damascus Township

The Caterpillar HT4 Shovel which Damascus Township, Pa., bought last summer was scheduled for road maintenance work. A few days after the equipment was delivered, the worst flash flood in 20 years tore out township creek beds and bridges. It was then the township discovered what a versatile machine it had purchased.

"It was a lifesaver," recalls Lee Walter, township supervisor. "It helped us repair storm damage, bridges and stream beds."

The Caterpillar HT4 Shovel is engineered to do a multitude of chores . . . to take punishment . . . and to stay on the job!

Its construction is the tip-off. All-welded lift arms are box section. The girder-type, all-welded frame is mounted low and close to the carrier rollers to keep the load off the transmission and tractor frame. A spacer bar between the lift arms keeps the bucket level. It stops twisting and bending of the lift and bucket control arms.

The Cat HT4 Shovel—with its all-around usefulness and sturdy construction—helps you fight back at rising costs. Its speed of operation and quality manufacture make it a wise investment today. Your Caterpillar Dealer—who gives quick, expert service—will be happy to demonstrate the Caterpillar Shovel that meets your needs.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

PUBLIC WORKS

OCT NOV DEC JAN FEB MAR

VOLUME 84 • NO. 2 FEBRUARY 1953

No More GRIPES about GARBAGE

FIRST official act of Mayor Horace S. Graham when he took office January 1, 1948 in Poughkeepsie, N. Y., was to answer the telephone. It was a complaint. "And," he recalls, "for many months that year, my telephone rang almost continually, and all the complaints were about one thing—garbage."

He was averaging about a thousand calls a month that year and things got so bad that just before the 1948 Poughkeepsie Regatta, the mayor headed a vigilante committee that enlisted trucks and volunteers to collect rubbish in downtown Poughkeepsie to clear the streets of refuse before the thousands of visitors reached town for the week-end.

"Things got so bad with collections," former Mayor Graham reminisces, "that our system broke down completely. The last three trucks we had were stranded on their routes and our city of 41,000 was temporarily without collection service."

Right after the regatta clean-up in 1948, Mayor Graham organized a Citizens' Committee on refuse collection and held open meetings to do something about the bogged-down system. He called in experts, rode collection trucks, visited many other cities, and took the problem as a personal responsibility. The Common Council agreed; approved the organization of a new Sanitation Department in November, 1948; and set February 1, 1949, as the date it was to take over the city's refuse and garbage collection. To further center responsibility, the council placed full responsibility on the Mayor.

Mayor Graham's look behind the refuse scenes led to the man who gave the magic touch to the garbage problem in Poughkeepsie. His name is Fred Hampe, then working as a supervisor in the City's Board of Public Works. The two began working together and things began to happen. They decided to junk the collection equipment they had inherited and studied the newest kinds of trucks and bodies on the market, figuring carefully for enough equipment to provide adequate service. Says Mr. Graham:

"When the trucks arrived, people wondered. The trucks looked different—something of a novelty—for we were the first city in the country to use this type of truck for refuse collection. Fred Hampe and his men went to work. Quietly, but quickly, things began to happen. The new trucks caused no end of conversation, but the piles of refuse disappeared.

"Hampe's men not only covered the city's 75 miles of streets in record time, right from the start, but they set up an emergency service to handle special collections. And gradually, the Sanitation Department began to be talked about—favorably this time."

Mayor Graham pointed to the efficient sanitation department in his re-election campaign late in 1949, then retired from office in 1951, with the inauguration of a city manager form of government. Now City Manager Hayden B. Johnson and Mayor Robert E. Stevers continue to maintain high collection standards. The crew of "rollers" go into action at 6 PM every night, getting cans, boxes and trash out ready for the next morning's collections. Eight trucks start out before dawn and cover the entire city by early afternoon. The downtown business area is cleared before 9 AM so there is no traffic problem and sidewalks are clean before shoppers appear. One truck is held back for a reserve and emergency unit to finish routes if trucks are filled to capacity before completing their round.

● ANOTHER LOAD of refuse is checked in by Supervisor Fred Hampe as City Manager Hayden Johnson looks on.

Crew men are well skilled in their craft. The "shakers" perch in the body where they can snag on to all throws made by the "pitcher" who hardly wastes a motion as he grabs the refuse can or box, tosses to the "shaker", then takes a return pass of the emptied container. The "pitcher" then rides on the running board or hustles to the next stop and does a repeat performance. The driver rounds out the crew of three on each vehicle and these Sanitation Department crews exhibit a skill and a job pride which readily indicates why Poughkeepsie is gaining new recognition as a clean city.

"We consider Sanitation Department jobs as premium jobs," City Manager Johnson says. "We have no turnover problem and actually have a waiting list to fill vacancies. Drivers are paid $313.00 per month. Other crew members earn $10.40 a day." There is an incentive program that keeps the crew on the move and prospect of an early afternoon quitting time spurs them on to quick action.

The department's plan of work is flexible to meet the changing seasons' special needs. Spring is officially celebrated in Poughkeepsie with a city-wide cleanup spearheaded by the Sanitation Department.

"We'll take anything," Fred Hampe says. "That is—almost anything. Last spring, one person put out on the curb some benches 37 feet long that we had to refuse. But

(*Continued on page* 105)

This is one of the several special articles which will appear in the forthcoming new edition of the "Handbook of Trickling Filter Design."

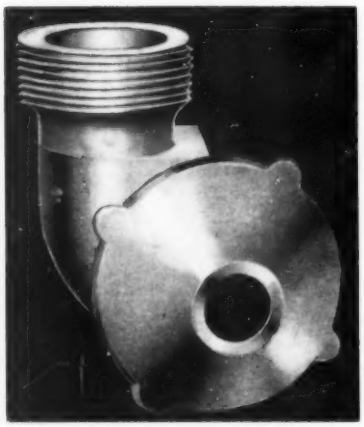
Engineering Data on the AERO–FILTER

J. A. Montgomery

IN the early thirties, Halvorson introduced the Aero-filter; then the Bio-filter was developed; and several years later, the Accelo filter made its appearance. Halvorson's work was carried out with an 8-ft. filter depth, while the backers of the Bio-filter laid emphasis on filters with media depths of 3 and 4 feet. Confusion exists in the minds of some engineers as to the basic features covered by these several patents.

Halvorson recirculated effluent from the final clarifier back through the filter, but his patent has to do with the method of sewage application onto the filter, and not with the method of recirculation. Halvorson covered the idea of dosage on each filter radius at least once every 10 seconds, whether this can be accomplished by increasing the number of filter arms, or by speeding up the conventional two, three or four-arm distributor. A two-arm distributor, running at 3 rpm, or a four-arm distributor running at 1.5 rpm would apply sewage on each filter radius once every 10 seconds, and therefore falls within the Aero-filter patent. The number of arms multiplied by the rpm, divided into 60, gives the dosage interval in seconds. Increasing the frequency of dosage on a given radius reduces the volume of dosage per sq. ft. per second, hence the term "Low-rate High-Capacity" was adopted for the Aero-filter. The whole idea was to increase the daily capacity of the filter by reducing the momentary rate of application per sq. ft. of filter surface.

To obtain a lower rate of momentary application, the multiple arm distributor and the disc distributor were developed. Centrifugal type nozzles are used with the multiple arm distributor. The throats of these cast aluminum



● **CAST aluminum nozzle and cover.**

nozzles are 1¼ inches in diameter, while the removable covers have orifices which range in size from ⅝ inch to 1¼ inches in diameter. The nozzles are easily cleaned without altering the orifices, but when good primary clarifier skimming is employed, it is seldom necessary to clean them. Both the centrifugal nozzle and disc distributor produce a rain-like application on the filter.

Levine and Jenks placed emphasis on increasing the number of passages through the filter by recirculation, without reference to the momentary increased rate of application. The Bio-filter patent covers the idea of recirculation through the primary clarifier and filter. The accelo filter refers to recirculation of unsettled filter effluent directly back to the filter, without passing through either the final or primary clarifier. The Ward patent covers the idea of recirculating final clarifier effluent back through the filter. Practically all of the manufacturers of filter distributors are licensed under the Ward patent, including the manufacturers of both the Aero-filter and the Bio-filter.

Table 1—Recirculation Ratios

Max. ppm BOD Settled sewage	*Recirculation Ratio*
130	Non-parallel
170	1 : 1
220	2 : 1
260	3 : 1
325	4 : 1

Recirculation

Whether recirculation is carried on through the primary clarifier or through the final clarifier seems to make little or no difference as far as results are concerned. In any event, final sludge and scum should be returned to the primary clarifier for resettling before it is pumped to the digester. This reduces the volume of water pumped to the digester, and in turn reduces the quantity of supernatant returned to the plant. Pumping of sludge to the digester one minute to two minutes every hour, by means of time-clock control, is preferable to hand-control pumping, since it insures a clean primary and at the same time returns supernatant in quantities that are easily handled by the filter.

Two types of recirculation are employed with high-rate or high-capacity filters. The first, which we term non-parallel recirculation, merely maintains a continuous minimum rate on the filter and the second type, which should be used for strong sewages for dilution purposes, is termed parallel recirculation.

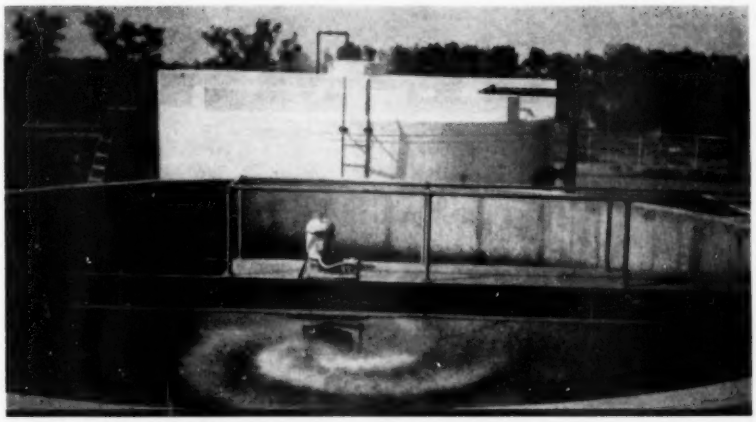
When non-parallel recirculation is used, it can be carried on through either the primary or final clarifier without increasing the clarifier size. When parallel recirculation is carried on through either clarifier, the clarifier should be increased in size in proportion to the amount of parallel recirculation used.

To avoid increase in final clarifier size when parallel recirculation is employed, it is common practice to bring the return from a final straight-line clarifier from a point a short distance from the inlet. Manufacturers of center feed clarifiers make the return from a point

adjacent to the center of the tank. When Spiraflo clarifiers are used, the recirculation is taken from the race of the clarifier, between the scum pipe and the inlet, thus providing a travel almost around the clarifier for removing the heavy sludge.

The BOD removal through a filter is on a percentage basis, whether it be in terms of pounds or ppm of the BOD. A properly designed and operated Aero-filter will remove from 75 to 80 per cent[1] of the applied BOD, settled sewage basis, when using non-parallel recirculation, provided the application is not in excess of 2 lbs. of BOD per cu. yd. of media. We, who have been using the Aero-filter, have quite definitely found that a plant effluent in excess of 30 ppm of BOD is not suitable where dilution is small, and that such an effluent should contain at least a few parts of nitrates. We have not been able to show nitrification unless the applied load, on a settled sewage basis, is held at 1½ lbs. of BOD (2400 lbs. per acre ft.) or less, and unless enough recirculation is used to keep the final effluent at 30 ppm of BOD. or less, when using filter depths of 6 ft. or more. A single stage Aero-filter can be expected to provide such an effluent when using the recirculation ratios shown in Table 1.

Two-stage operation is recommended for strong sewages, since considerably less recirculation is required than for single-stage.



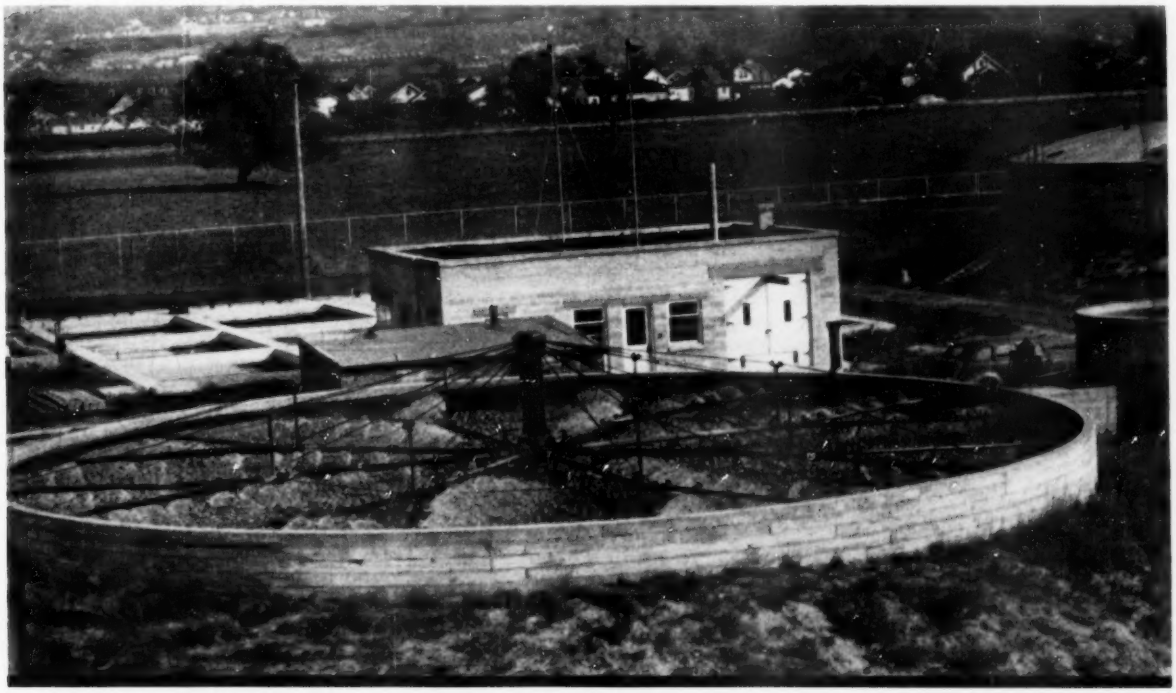
● **DISC DISTRIBUTOR applies sewage to filter media at a low momentary rate,**

A two-stage Aero-filter plant, using Spiraflo clarifiers, produced the average results shown in Table 2 for nine months (Nov. to July, 1950) continuous operation at Bryan, Texas, using non-parallel recirculation. Each of the three clarifiers is 52 ft. in diameter, while the two Aero-filters are 65 ft. in diameter and each has an 8-ft. depth of rock. There are 983 cu. yds. of rock in each.

Filter Depths

Based on an equal number of cu. yds. of filter media, we recommend the deepest filter possible to a maximum of 8 ft., commensurate with local conditions. In single-stage or in the first stage of a two-stage plant, we recommend against the use of less than 6 ft. of depth, with perhaps a 5-ft. depth the extreme minimum. In two-stage high-rate filter operation, especially for strong sewages, we recommend that 60 to 65 per cent of the total media be placed in the first stage, since most of the BOD is carbonaceous. The second stage should be used for polishing the effluent. For the same amount of media, relatively deep filters are cheaper to construct than shallow filters, since they require less concrete and less underdrain

(*Continued on page* 94)



● **MULTIPLE-ARM rotary distributor is designed to dose filter media at least once every ten seconds.**

MORE MONEY and NEW EQUIPMENT for

C. E. WRIGHT

HANDICAPPED by lack of funds, the State of Georgia has not been able, in the past, to carry on the programs of road construction, reconstruction and maintenance demanded by the steadily increasing volume and constantly growing weight of traffic. This condition will shortly begin to become better as a result of the approval by the voters, at the November election, of a constitutional amendment requiring that all net funds from motor fuel taxes and motor vehicle license fees shall be appropriated exclusively for improvement of roads and bridges through the State Highway Department.

In the several years following World War II, the State Highway Department had at its disposal amounts varying from $19,000,000 to $30,000,000 per year, but these were appropriated sums, since receipts from gasoline taxes and license tags went into the general fund. The higher amounts appropriated in 1951 and 1952—approximately $50,000,000 for the biennium—were obtained at the special insistence of Governor Talmadge. This year (1953) under the new law, the State Highway Department will have about $60,000,000, or perhaps twice as much as was ever before available.

In addition to a larger state-wide program, the Highway Department is cooperating in the design and construction of the Atlanta Expressway. This is a 10-year, $80,000,000 program, and one of the most ambitious ever conceived on a freeway basis in the Southeast. It is being built under the direct sponsorship of the Joint Bond Commission of Fulton County and Atlanta, composed of ten members, five each from city and county. General supervision of the work is under Col. M. E. Cox, engineer and executive secretary, who has had a long experience with the State Highway Department and the Army Corps of Engineers. The project includes 40 miles of 4-lane highways, many bridges and cloverleaf intersections and a depressed section, to be built in 1953, through the central business area of Atlanta.

A Million for New Equipment

Of the $60,000,000 which the Georgia Highway Department will be able to expend this year, about $10,000,000 will go for maintenance, as follows: For regular maintenance, including patrol operations, $6,500,000; for new equipment $1,000,000; and for betterments $2,500,000. There are 15,228.4 miles of roads in the State Highway System, of which 11,085 miles are paved. Even with the limited appropriations of the past years, it was possible to surface-treat about 750 miles; but there was need for work also on some 12,000 miles of secondary post roads and farm-to-market roads. But because of the many years of virtual neglect, there is more work to be done than even the much larger appropriations will immediately provide for.

Much of the betterment and maintenance work has involved widening and surfacing of the old concrete roads. Many of these were only 18 ft. wide originally but have since been widened to 24 ft. In widening, the usual standard procedure is followed of using a special widening machine to cut the trench, which may be 2 to 5 ft. wide, but is usually 3 ft. Two-course penetration is normally placed for these strips. Where past maintenance has been lacking, some of the widening strips have deteriorated and require extensive repair.

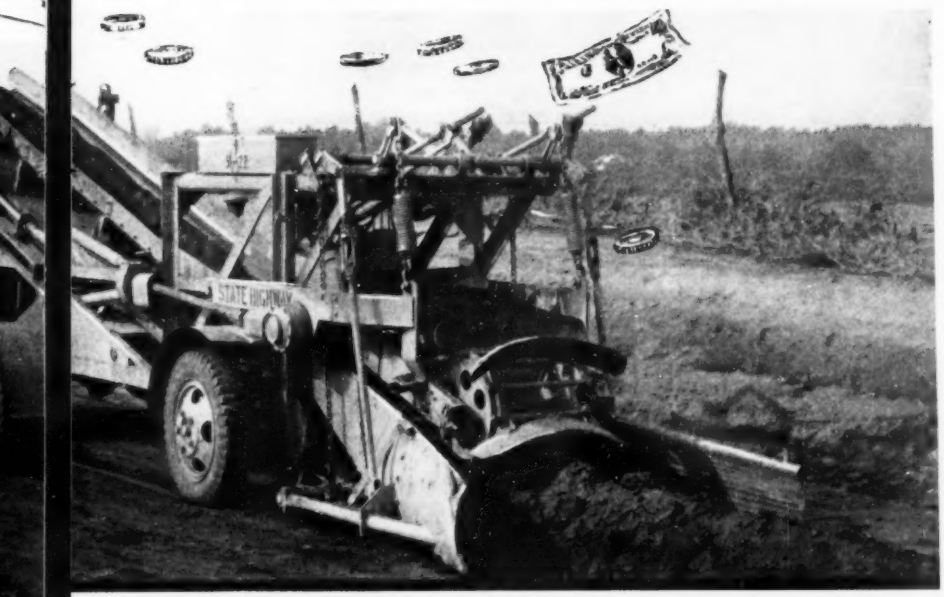
Both hot mix and cold mix resurfacing have been placed on these old concrete roads. The Department has had much success with two Hetherington & Berner Moto-Pavers. One machine and crew can place from three-quarters of a mile to a mile of 1½-inch cold mix over

● **SHOULDER reconstruction is part of the accelerated maintenance program.**

GEORGIA HIGHWAYS

a pavement 20 to 24 ft. wide. Two Barber-Greene continuous mix plants are used for hot-mix surfacing, a sand-asphalt mix being frequently used. On widening and resurfacing jobs, it has been found that depressions are less likely to occur, and a better riding surface results, if the final surface is placed after traffic has compacted the subcourse. Also, according to C. W. Leftwich, State Maintenance Engineer, it pays to level up depressions ahead of the final surfacing by dumping pre-mixed material and spreading it with a motor patrol long enough ahead of the surface to permit traffic to compact it.

Also used in the widening and surfacing operations are front-end loaders for building up stock piles of material, loading top soil and selected material from pits, and taking excess material from ditches. The Department uses both Adams and Athey force-feed loaders for cleaning ditches and picking up windrowed material. With these is the usual complement of tractors, trucks and motor graders. Also, each of the five divisions has a truck-mounted crane or dragline and a pile-driver.



● **INCREASED FUNDS bought a $1 million worth of new maintenance equipment.**

Surfacing Work

Last year about 350 miles of State Highway were resurfaced with hot or cold mix; and about 750 miles were surface-treated. On some of the resurfacing work, where the old surface had broken badly, an entirely new pavement was placed. This consisted of a penetration base, 2½ ins. thick, followed by 2 ins. of hot binder and 1 inch of dense graded surfacing. This method, however, has not been wholly advantageous in the opinion of the engineers. "We have come to the conclusion, after trying this method on many roads," says Maintenance Engineer Leftwich, "that it may be more practical to apply only a binder and leveling course, with a dense top, omitting the penetration base. Such a 3-in. topping should give good service for many years."

In addition to the work it does with its own crews, the Department has let contracts for widening and resurfacing many miles of old roads. The same general procedures and standards are used as for force-account work.

Supplementing the road problems it faces, the Georgia department has 3600 bridges, totalling 118.7 miles long, on the state system. Many of the small wooden bridges built more than 25 years ago are in need of complete rebuilding or replacement. Here, and on all bridge replacement, pre-cast concrete deck structures will be largely used.

Staff Data

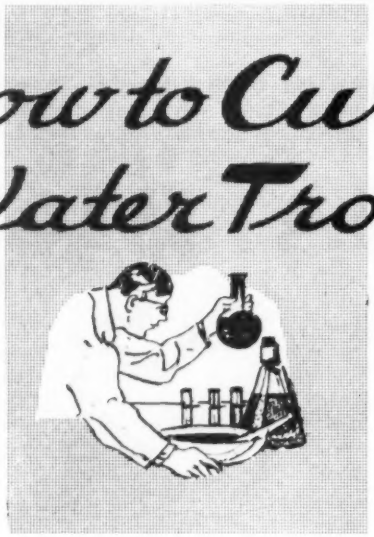
Meanwhile, a state-wide survey is being made to determine where the additional funds now available should be spent to best advantage. The State Highway Department is well organized for its enlarged tasks. What it has lacked has been the money to do the jobs that have been begging for attention. The department is directed by a three-man board, consisting of Jim L. Gillis, Sr., chairman; John Quillian and Dixon Oxford, with the technical staff made up as follows: M. L. Shadburn, chief engineer; C. S. Fain, construction engineer; C. W. Leftwich, maintenance engineer; S. P. Allison, urban engineer; and C. N. Crocker, bridge engineer. Serving under them are five district engineers; W. C. Smith, Gainesville; R. G. Ray, Jr., Augusta; J. C. Collins, Macon; J. O. Bacon, Savannah; and Earl Olson, Tifton. All construction and maintenance in these districts come under the direct supervision of these division engineers. Each of the field division engineers is assisted by a highway engineer in charge of maintenance activities. In addition, there are two highway maintenance assistants,

(*Continued on page* 106)

● **RESURFACING with hot plant mix sand asphalt during the extensive program.**

Red water troubles can be cured at costs within reach of any community.

How to Cure Red Water Troubles



PHILIP S. DAVY,
Davy Engrg. Co., LaCrosse, Wisc.

IT is not necessary to describe or explain red water troubles to any community that has suffered, or is suffering, from them. For the information of others we will say that red water will cause complaints on the score of lack of potability, staining of plumbing fixtures, spotting of laundry, creation of tastes and odors, clogging of water mains and interference with the use of the water for many industrial purposes.

Red water is due, of course, to the presence of an excessive amount of iron and/or manganese in the water. These minerals may result from any one or two, or sometimes from all, of the following causes: (1) Iron and/or manganese may be present to an undesirable extent in the raw water; (2) the water supply may be so corrosive that iron is picked up from the distribution system; and (3) growths of the so-called iron bacteria, Crenothrix, and sulphate reducing bacteria may concentrate the available iron in the water and may also attack the iron piping.

Steps in Control and Cure

The first procedure, of course, is to determine the specific cause or causes of the red water; and the second is to apply suitable treatment for correction. In general, when the trouble is due to iron or manganese in the water supply, the red water problem will occur throughout the entire distribution system; if the trouble is due to corrosive qualities in the water itself or to the presence of iron bacteria, the situation will be worse in dead ends and in areas of little circulation. However, laboratory tests of the raw water and of samples from various points throughout the distribution system should be made to determine the iron and manganese content, the pH, carbon dioxide, alkalinity and hardness. Tests should also be made to determine applicable treatment factors, as adjustment of pH, effects of aeration, and coagulation requirements. These tests will give the background necessary for determining the most effective methods of treatment.

When the red water is due to the presence of iron and/or manganese in the raw water, any one of various treatment methods may be utilized, including (a) aeration, followed by coagulation and gravity filtration; (b) pressure aeration and filtration; and (c) removal by base exchange.

The first method, that of aeration followed by coagulation, settling and gravity filtration, usually involves relatively high costs for construction and also requires a considerable degree of operating skill and attention after construction. This process can be combined readily with softening by the lime-soda process. Unless the community is a fairly large one, or unless softening or other treatment processes are involved, a simpler and less costly method will usually be preferable.

Pressure Aeration and Filtration

Where the water supply is delivered from wells by turbines, direct pumpage through a pressure treatment plant is possible. No surface reservoirs or booster pumps are then required. In most cases both the iron and the manganese are present in the water in soluble forms. In treatment, air is added to the water as it is pumped to the pressure treatment plant, about 0.07 cu. ft. of free air at 80°F being required to oxidize each part per million of iron as Fe. The iron is precipitated and is removed by the sand or anthrafilt layer in the pressure filter. The rate of operation of such pressure filters is in the order of 2½ to 3 gallons per minute per sq. ft. of filter area. Backwash rates are from 15 to 20 gallons per minute per sq. ft.

This method of treatment will usually reduce the iron content to 0.2 ppm or less. However, consideration must be given to three other factors.

If manganese is present in the water, either alone or in excess of the amount of iron present, tests should be made to determine if it can be oxidized by aeration alone to a state where filtration will remove it; or whether pH adjustment or detention in a settling basin is needed prior to filtration.

The method of adding air to precipitate the iron is important. Only small quantities of air are needed. If too much is added, it may be entrained in the water, causing a "white water" problem.

After iron removal by aeration and filtration, further treatment of the water may be necessary in order to prevent corrosion, with accompanying high iron concentrations in the dead ends and little used parts of the distribution system.

Treatment by aeration and pressure filtration, when properly handled, is very effective in iron removal. The installation at Alma, Wisc., which utilized a pressure filter made by the General Filter Co., showed a reduction in iron content from 0.8 ppm to 0.2 ppm. Total hardness was unaffected by this treatment, remaining at 260 ppm; and methyl orange alkalinity was only slightly changed, rising from 256 to 286. In this particular case, further treatment of the water was necessary by adding caustic soda to raise the pH to above 8, since the raw water contained 22 ppm of free CO_2.

Removal by Base Exchange

Since zeolites used for softening will remove iron and manganese as well as hardness, this method can often be used for a double pur-

pose. Certain precautions are necessary. Introduction of air into the system must be held to an absolute minimum, or insoluble oxides of iron and/or manganese will be formed and these will be filtered out by the zeolite bed. In time, the deposits will clog the zeolite bed and destroy its ability to soften the water. In most systems, complete exclusion of all air is not possible and there will be some deposits of minerals. To prevent damage due to clogging, carbonaceous or synthetic resin type zeolites, which may be acid-cleaned, can be used.

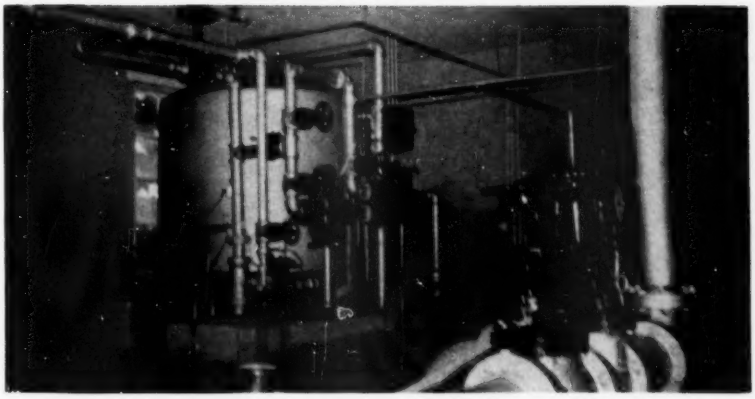
When a zeolite is used for both softening and iron removal, the problem of by-passing a part of the water to maintain some hardness in the distribution system becomes complicated. If the iron content is 1.0 ppm and half of the water is bypassed, the iron in the delivered water will be excessive. This problem can be met by treating the by-passed water with an iron removal plant of the aeration and pressure filter type. Or the entire supply can be softened to essentially zero hardness. Though this has been objected to in the past, there are no valid reasons against using such water. Several Wisconsin municipalities have used zero-hardness water for two to fifteen years without difficulties. Corrosive tendencies in this softened water must be corrected, of course by one of the several methods available.

The efficiencies of the newer synthetic resins are surprisingly good. Guarantees have been made covering as little as one pound of salt per 4,000 grains of hardness removed. With salt at $12 per ton and a water containing 20 grains of hardness, the cost to soften to zero hardness would be only 3 cents per 1,000 gallons. In Arcadia, Wisc., where this method is used, hardness is reduced from 221 to 3 ppm and iron from 3.1 to 0.1 ppm. By using sodium hydroxide following softening, free CO_2 was reduced from 9 to 0 and the pH was raised from 7.6 to 8.9.

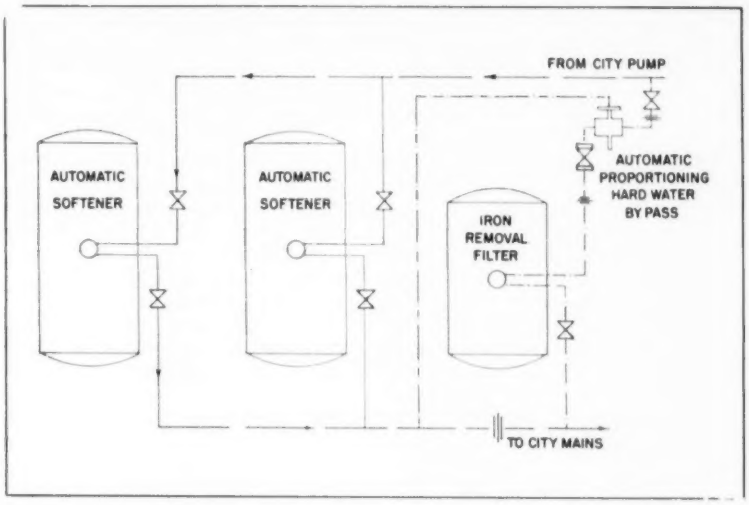
Controlling Corrosion

Many of the ground water supplies in the North Central States are corrosive, due largely to the free CO_2 in the water. Ground waters from magnesium or lime areas are less likely to be corrosive because the CO_2 is converted to bicarbonate hardness. We have found that the addition of lime or sodium hydroxide to raise the pH to above 8.2, usually between 8.2 and 8.4, elim-

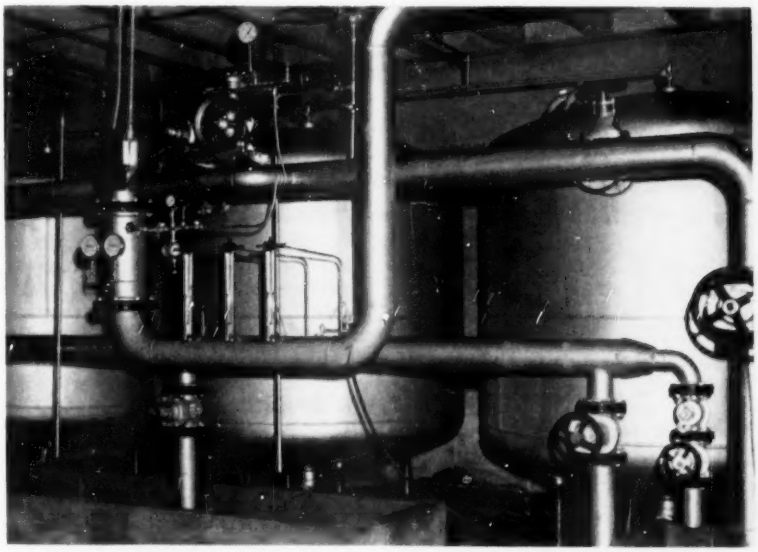
(*Continued on page* 122)



● **SOFTENING** and iron removal equipment installed at the Blair, Wis. plant.



● **SCHEMATIC DIAGRAM** shows combination of softening and iron removal units with automatic proportioning hard water bypass used at Arcadia, Wis. plant.



● **IRON CONTENT** of the Alma, Wis. water was reduced from 0.8 ppm to 0.2 ppm.

Calculating Earthwork Volumes by a Contour Grading Plan

FOR calculating volumes of proposed cuts or fills in planning highway construction, the method ordinarily employed is by vertical cross-sections. Ground elevations are taken at 50-ft. intervals by a survey party and plotted in the office, the proposed finished construction section is superimposed, and the area between the two lines determined as a basis for calculating the volume by the average end area method. In mountain work, this method is laborious and in all cases is time-consuming; and the cross-section sheets are bulky and voluminous. A method using contour maps and eliminating the drawing of cross-sections has been developed and used by District VIII of the California highway department.

Briefly this consists of preparing a contour map of the proposed location of the highway (which generally is done anyway); and drawing on this the contour lines of the finished cut or fill, each line terminating in the corresponding contour of the existing surface. The two sets of contours at each elevation then enclose a horizontal section of the proposed cut in fill. These horizontal areas or sections are then used instead of vertical sections in calculating the volume. The area of each horizontal section is measured by planimeter and reduced to square feet. The vertical distance between consecutive sections is the contour interval, which can be made anything desired. If desired for greater accuracy, intermediate contours may be drawn to provide for abrupt changes in either the original surface or the finished surface.

The contour grading plan is especially applicable to odd-shaped construction, such as intersections, either channelization or interchange, and rounded and warped surfaces designed for landscaping. It is not generally recommended where it is necessary to know the volume of each 50 or 100-ft. length of the construction.

As for accuracy: in one case, omitting the use of intermediate contours, the error was found to be 4.4% when compared with calculation by the average-end-area method based on field cross-sections. In another case, using intermediate contour intervals where needed, the average discrepancy was 1.7%, with a maximum of 2.7%. Recalculating with the use of prismoidal corrections gave an average correction of —1.2%.

The scale for contour grading plans should preferably be not less than 1 in. = 50 ft. Scale at interchanges where staking might be performed by scaling should be 1 in. = 20 ft. Contour interval for mountain terrain can be 10 ft.; for rolling terrain, 5 ft.; for flat terrain, 1 or 2 ft.

Advantages of the Grading Contour Plan:

1. It is estimated that earthwork calculations, together with attendant drafting and survey operations can be accomplished with a savings in man hours of about 40 percent.

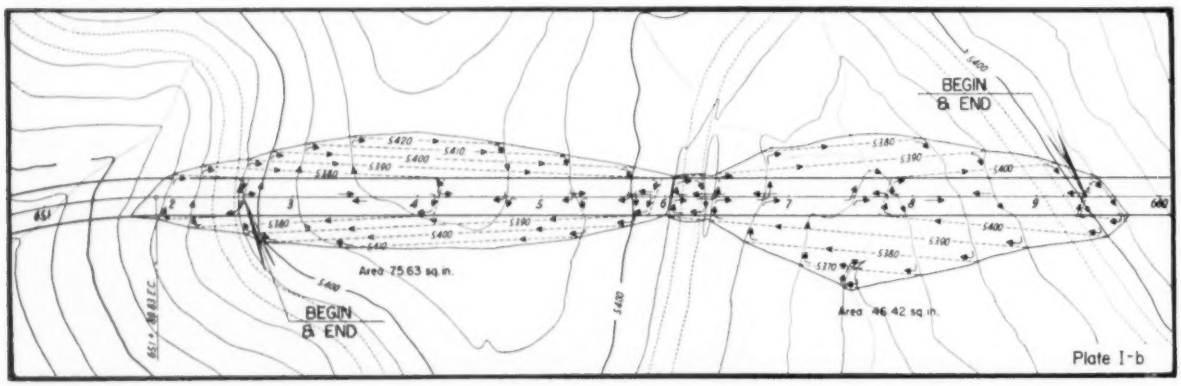
2. Culvert location, length and skew can be accurately and easily determined. The entire drainage system is presented by a clear and comprehensive picture.

3. Design and calculation of earthwork and construction staking at interchanges with warped cut and fill slopes coupled with roadways intersecting at odd angles would be materially improved.

4. It is ideally suited for full advantage adaptation to aerial photogrammetry. Surveying by photography is rightfully coming into general use and unquestionably is the key to speeding up highway construction plans to keep pace with expansion of highway construction programs.

5. It sharply reduces number of drawings included in a set of highway construction plans.

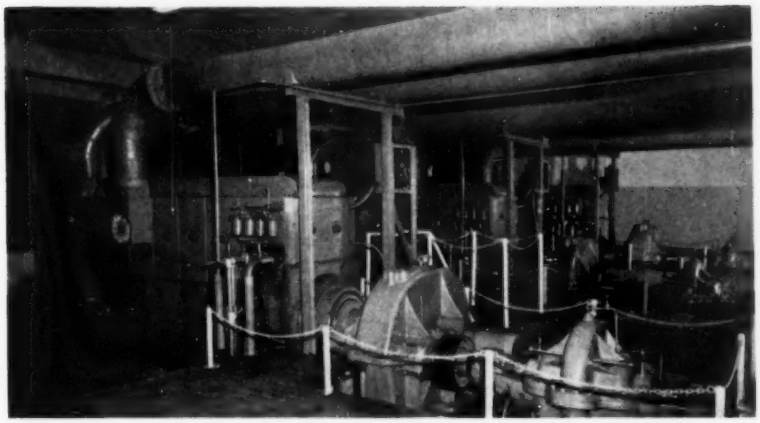
Detailed descriptions of the methods of using this plan, with illustrative examples, are given in an article in *California Highways* by C. V. Kane, District Highway Engineer, of which the above article is a condensation.



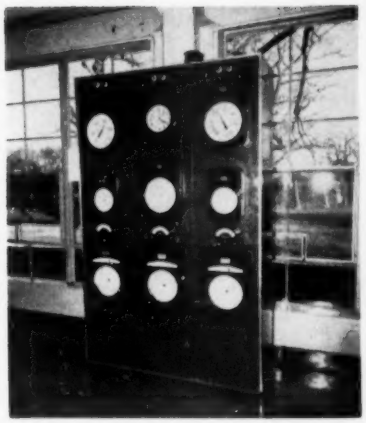
● **TYPICAL CONTOUR MAP including finished contours of cut and fill. Arrows show areas measured by planimeter.**

Incentive Pay for Better Garbage Collection

Under an incentive system instituted by Albuquerque, N. M., the driver and helper operating a garbage collection truck are eligible for bonuses of $10 and $7.50 per month respectively. The payoff is to the team from whose route the fewest complaints are received during the month. Payment is made out of the fees received for garbage collection.



● **PUMPING STATION** at Mission, Texas, showing three dual-fuel engines.



● **CENTRAL** control panel groups meters.

DUAL FUEL ENGINES CUT PUMPING COSTS

AT Mission Pumping Station, San Antonio, Texas, three 390-hp Fairbanks-Morse dual fuel engines drive three centrifugal pumps each of which has a capacity of 8 mgd. These engines have reduced power costs for pumping by more than 60 per cent, and have achieved the lowest operating costs in the entire city water system.

Mission Station, officially Pumping Station No. 4, was built in 1922 as a standby installation, but rapid post-war increases in water consumption necessitated expansion and regular use. Originally, the station had three electrically driven centrifugal pumps with a total capacity of 18 mgd. The engine driven pumps were installed in 1949. These are FM, of 8 mgd capacity each, driven by three 390-hp dual fuel engines operating at 514 rpm. The pumps are driven at 1045 rpm through herringbone gears. Water is drawn from 10 artesian wells which deliver the water at about 10 psi, which is raised by the pumps to 97 psi. All of the wells are connected to one 28-inch header which runs the length of the plant. The pumps are single-stage, double-entry centrifugals with 14-in. suction, 12-in. discharge and 23 ½-inch impellers. The pumps discharge into two 20-in., one 18-in. and one 12-in. outgoing mains.

Since the installation of the new pumps and engines, the station has been used for large-volume service. It handled an average of 16.5 mgd last summer, with an evening peak rate of 22 mgd. Even in the winter, the station pumps as much as 7.5 mgd. The engine-driven pumps do the bulk of the work with the old electric pumps maintained in operating condition for true standby service.

The dual-fuel engines, which utilize natural gas as their principal fuel, have demonstrated that important economies can be attained as compared with the use of purchased electric power. In the years 1949, 1950 and 1951, the engines consumed fuel costing a total of $25,356.40 in pumping 7,317 million gallons. This represented an average fuel cost for pumping of $3.46 per million gallons.

It is difficult to make direct cost comparisons between the electric power previously used and the new engines because the station switched from standby and peak service use to full-time operation when the new equipment was installed. The plant engineers calculate that the fairest figure to compare with the $3.46 fuel cost per million gallons pumped by the dual fuel units would be about $9.00 per million gallons. This allows for the increased economy due to the larger volume and continuous operation, and excludes labor, supplies and depreciation. On this basis, the dual fuel engines have cut costs $5.54 per million gallons, a reduction of about 60 per cent. This amounts to a saving of more than $40,000 for the three years since installation.

Control equipment for the plant is complete and compactly grouped. A single lever on the engine is used to start, to stop and to switch from dual-fuel to full diesel operation. Adjoining this control lever are the governor and an emergency shutdown control. Beside each engine is a separate panel with gauges, exhaust pyrometer and an automatic alarm system. The central control panel indicates and records suction and discharge pressures and shows the pumping rate of each engine-driven pump. A tachometer shows the rpm of each engine.

The San Antonio water system is administered by the City Water Board. Although the Mayor is a member during his term of office, the Board functions independently of the municipal government. System operations have been directed for more than 35 years by the Manager, W. D. Masterson. His assistant, R. A. Thompson, Jr., directed the design of the Mission Station.

● ● ●

Controlling Water Levels

At a water works sectional meeting, Jack Adams, Superintendent, Carlinville, Ill., described in detail the electric control device they use to maintain their elevated tank full without running it over, even though the tank is located in town several miles from the treatment plant. Numerous methods were tried without success before the present system was installed. This equipment consists of a sending and receiving set at the tank and plant connected by a control line. A pressure-actuated receiving set at the plant records the water level in the tower every 15 seconds with relays controlling the high-service pump. Since the installation of this equipment, the tower has never been overflowed and the water level has not dropped below 2 feet of the overflow. The installation cost $2,000 with a saving of $60 in the power bill for the first month. This was reported in "Over the Spillway", State Board of Health publication.

AIR SURVEYS GET BETTER MAPS FOR A UTILITY

THE answer to a problem which has plagued many utilities in recent years has been found by the Philadelphia Electric Company. That problem is the acquisition and maintenance of complete, up-to-date maps to use in planning and construction projects. To meet this need, Philadelphia Electric is having the entire four-county Philadelphia suburban area it serves remapped to its own specifications, carefully drawn by its engineers, in consultation with specialists in the utility mapping field.

The territory served by Philadelphia Electric has undergone tremendous change as the result of increased population and industrial expansion since the time most available maps were compiled. Current maps are either a jumble of names and lines, where new developments were added to existing maps, or deceptive in that the new developments were not added. An exception is the city of Philadelphia proper, which is adequately mapped and will not be covered in this project.

The project, which will be finished within a few months, is being done in two stages.

First, an aerial survey was made. The result of this survey is in the form of an aerial photo-map covering nearly 3,000 square miles. The photo-map is at a scale of 800 feet to an inch and is composed of sixty-six sections each measuring 34 by 52 inches. Each section matches adjacent sections to a hairline so as to assure accuracy on projects for areas included on several sections. These sections, when placed together, form an over-all map 33 feet by 45 feet.

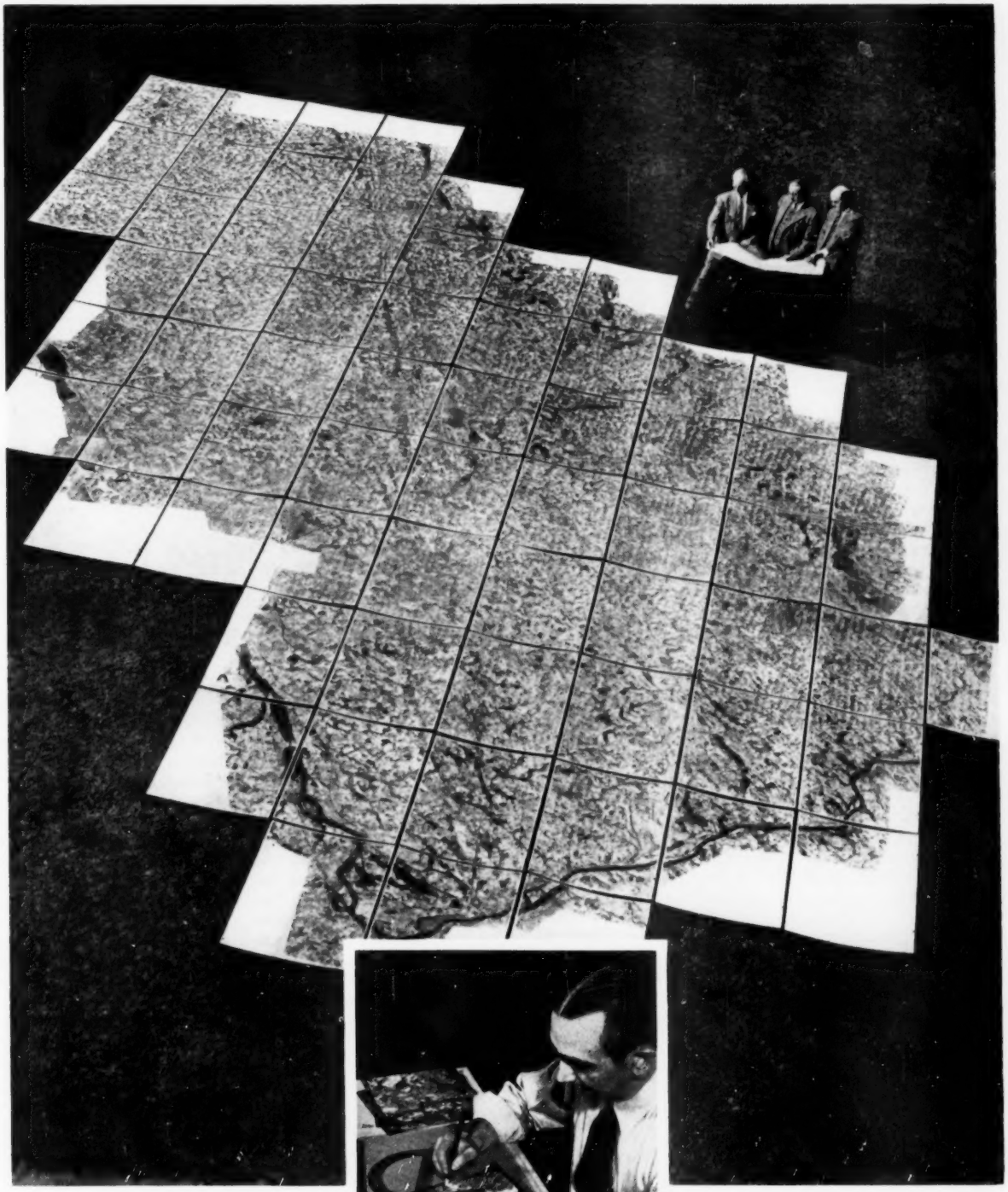
Base drawings are now being made from the photo-maps and are reproduced on plastic sheets. These maps will show highways, rivers, streams, railroads, municipal, county, and state boundaries, and other important topographical features. The base drawings will be the same physical size as the photo-map sections and drawn at the same scale. From these plastic drawings, reproductions can be made photographically at scales varying from 100 feet to an inch to 3,000 feet to an inch. This is desirable, since single maps of large or small selected areas are frequently needed at different scales, depending on their use.

Photos courtesy Aero Service Corp.

● **CHECKING a completed work map with a photo map. These are scaled at 800 feet to the inch. Circles on the map were added by the artist.**

The highways shown will be of the double-line type, and lettering will be done in different type faces indicating the nature of the features named in an accepted cartographic manner. For example, names of roads will be set in one type face, rivers in another, and towns and cities in still another. The lettering will be set by linotype and printed on clear plastic strips. These strips are placed on the original master maps, and eventually become part of the ensuing plastic reproductions of the master map.

The aerial survey and photo-map was made for Philadelphia Electric by Aero Service Corporation of Philadelphia. Aero Service pilots made twenty-six line flights over the four-county area to get the photos necessary to make the photo-map. They took pictures, 806 in all, at 10,000 feet altitude and at a flying speed of 120 miles per hour. The camera shutter was timed to take a picture every 90 seconds so there would be no gaps between the areas shown on the negatives. A roll-type film, 180 feet long and 9 inches wide, was used. Approximately two hundred 9-inch-square exposures were made on each roll of film. The scale on the negatives was 2500 feet to an inch.

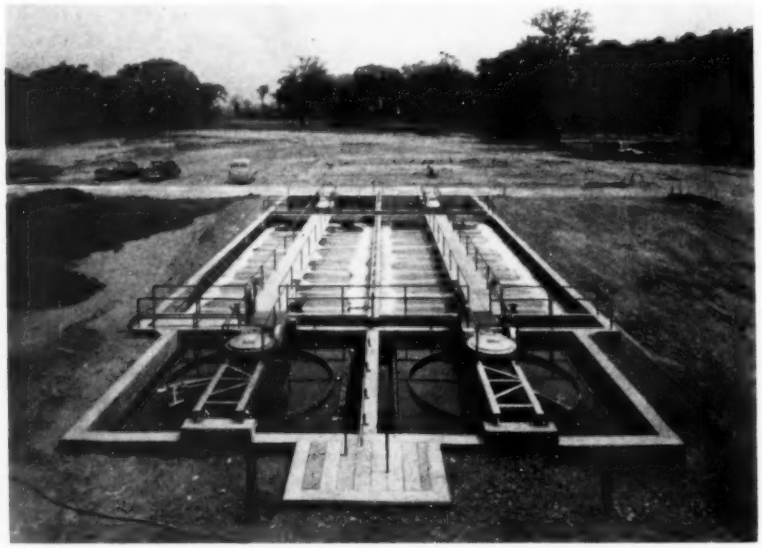


● **AERIAL** photo-map, shown above, measures 33' x 45'. Work maps for operations and planning are traced and reproduced photographically.

● **AT LEFT:** Assembling the individual aerial photos to form a photo-mosaic which in turn is rephotographed to provide the photo-map sections.

Industrial Wastes — A Community Problem

● **THIS IS the third of a series of articles which discuss the place of the community in the industrial waste problem. Preceding articles covered community - industry relations, waste surveys and the effects of industrial wastes on treatment facilities.**



How Much Should A Community Pay?

AS stated earlier, every industry which contributes to the material welfare of a community, either by providing profitable employment for a segment of its population, by helping the city treasury by the payment of taxes, or by its contributions to community welfare and enterprises, has a right to expect consideration on the part of the community.

It is equally true that an industry which, by its wastes or processes, produces any substance which may be a nuisance, either nasally or physically, or interferes with the enjoyment by the people of pure water or recreation, must accept the responsibility for having caused this nuisance.

With these two acceptances of responsibility in mind by both parties, a common ground can usually be found on which the problem can be solved equitably.

It is manifestly not equitable for an industry to expect that the community in which it is located should bear all the financial burden of handling its waste products, particularly if those products or the products of their reactions with other discharges will mean the expenditure of large annual sums for maintenance of plants and even larger initial sums for the enlargement or improvement of existing works and structures.

On the other hand it is just as true that the community should not compel the industry to bear the entire cost of treatment of its liquid wastes, if facilities are available to handle them in a diluted form in the community works. As taxpayers and employers of labor, industry is entitled to a hearing and has a just claim on mature consideration of its inherent rights.

This problem may be approached from several angles, all of which have merit and none of which will be found to apply to all cases. Proper technical and economic studies of all of the factors will usually result in a solution satisfactory to all concerned. These angles are briefly:

1. The acceptance by the community of the burden of handling the liquid wastes of industry in its existing plants and structures without recompense; or,

2. The acceptance of the wastes into the public systems, but on a basis of equitable payment of a charge by the industries involved for the wastes as received in the system, on a volume or strength basis, or both; or,

3. Acceptance of the wastes into the community system on the basis of the industry paying the capital costs of any additions to the present treatment works made necessary by the acceptance of its wastes; or,

4. Acceptance by the community of the wastes into its public systems, but on the basis that the industry will pay an equitable charge for its wastes, based on the excess of their strength over and above the proven strength of the local domestic sewage; or,

5. Refusal of the community to accept the wastes of the industry

EDMUND B. BESSELIEVRE
Mem. Amer. Soc. Civ. Engrs.
Chief Sanitary Engineer,
International Sales
The Dorr Company, Engineers

and requirement that the industry construct and operate its own treatment works with no expense to the community; or,

6. Acceptance of the liquid wastes into the public system only after the industry has treated them in a plant constructed and operated at its expense to reduce the wastes to the normal proven strength of the local domestic sewage.

It will be appreciated that many factors will enter into any one of these various angles, such as public expediency, community policy, the importance of the industry to the community, the strength and character of the wastes, the extent and cost of the works which it may be necessary to construct to handle them, and the volume of the wastes.

These factors can only be resolved by a careful engineering study of the problem by capable technical men and their weighing of all of the various factors which may be pertinent to each one of these methods.

Discussion of the Problem

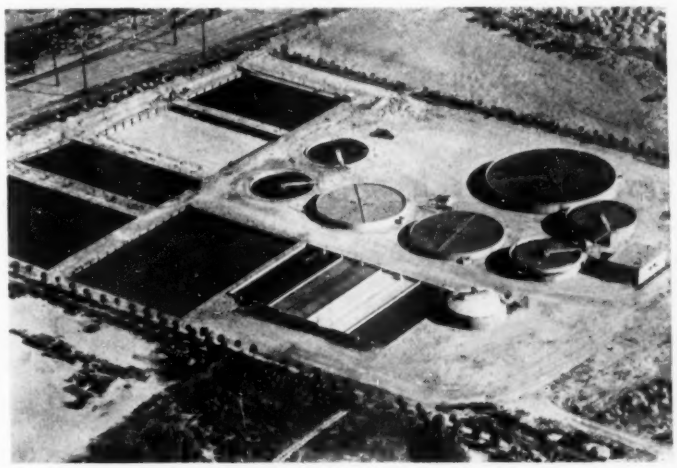
A brief discussion of each of the six angles mentioned above will serve to point out their advantages and disadvantages to either or both of the parties involved. The six numbered paragraphs below refer to the six proposals above.

1. The public utilities of all or most communities are supported by funds raised from the people by taxation or by charges for the services of the utility. This is especially true of sewerage systems and sewage treatment works which are usually financed from general funds. These funds in turn are normally raised by taxation on the real estate or personal property, or both, of the citizens and by sales and other taxes. The funds for capital additions are raised by issuance of bonds or other corporate obligations, the interest of which must also be provided from the general funds. In these days of generally high taxation and of protests against increasing it, it does not seem equitable that a community should arbitrarily bind itself to accept the liquid wastes of industry and provide the necessary plant and structures for treating those wastes completely at the public expense. Industrial wastes are frequently so complex and difficult to treat that to handle them may entail the construction of plants of a size, due to the excessive strength of the wastes, that would handle 3 to 4 times the same volume of municipal sewage. Not only the construction costs would be high, but engineering fees for the design would be involved, and the annual operating charges, interest and amortization of the capital cost would build up a very serious annual budget. Naturally, any industry is prone to favor such a plan, but if it will scrutinize the effect that such acceptance would make upon its own tax bill and the tax bills of its employees, executives, etc., they would, in many cases, find that this plan was not to their advantage.

2. Acceptance of the waste on the basis of equitable charges has manifest advantages for the community. It provides that the industry will pay a reasonable charge to the community for handling and treatment of its wastes. The plan does not provide for the industry paying for any extensions or improvements to the system rendered necessary by the inclusion of its wastes, except insofar as the carrying charges for the investment can be prorated into the rates. As will be discussed later, these charges may be levied in several ways. The plan is desirable from the industry standpoint as it does not require an outlay of capital funds on the part of the industry, and the annual charges for the handling of the wastes can be distributed as an item of production cost of small degree over their many units of production. On the other hand, the community must still bear the burden of financing any improvements or extensions to the works. Frequently this is difficult to arrange if the community has reached or is close to the borrowing limits.

3. The third plan, while appearing to be philanthropic on its face, is, when examined, not so clear. The plan is one generally acceptable to industry, for if when it is proven that with certain additions or improvements the local system can be made to handle the wastes, the industry is faced with only one set sum for handling of its wastes. This it can probably charge off as a capital investment. On the other hand, the plant will be operating for a long period of years, and if the community is burdened with the payment of all operating charges for the treatment, it may be assuming a financial burden which will last for many years; and in the end it may represent a sum greatly in excess of the initial cost of the improvements. This third plan favors industry and not the community

4. The fourth plan is, in the author's opinion, the most equitable



● **BREWERY waste treatment plant shown above provides two-stage Biofiltration, clarification and digestion. At top, left, is an activated sludge plant treating domestic wastes of an industry.**

for both parties. With it, the community recognizes the right of the industry, as a taxpaying and valued entity, to discharge into the public system its wastes if of equal strength to the normal sewage of the town. This can normally be done without change in the structures or operating procedure of the plant. On the other hand, it is fair to the industry which is being called upon to pay only for the handling of the additional strength of the wastes over and above the normal sewage strength. This plan may mean that the industry has two options, which it should explore: one, to build at its expense and possibly on its own property, the works necessary to reduce the wastes to a normal strength, in which case there would be no recurring charge from the community; or, two, to pay the charge set up by the community for this additional strength. Variations of this plan have been most widely adopted, as will be discussed later in this article.

5. This plan is an arbitrary one, placing the entire burden on the industry with no recognition of its rights. It may be imposed, however, when the community has no sewage treatment works which can receive the wastes and, due to its location, does not need such works. In this case, to build works merely to handle wastes of an industry would be an unfair burden on the community. In cases where local facilities do exist which could be made to handle wastes to a certain degree, this plan is not equitable, except rarely where the industry procrastinates in dealing with the problem and where cooperation does not exist.

6. This plan has been adopted in many cases and has the same advantages as Plan No. 4.

Formulation of a Charge for Handling Wastes

Assuming that it has been decided that it is equitable for a community to adopt the plan of charging industry for handling its wastes, what is that charge to be? How will it be formulated? And will it be equitable for all industries?

These cover a multitude of conditions and factors, and in the author's opinion, it is not possible to develop a specific formula which will be equitable in all cases. Such charges may be based on: (a) Volume alone; (b) waste strength alone, in suspended solids and BOD; (c) chlorine demand to stabilize the wastes; and (d) a combination of the above three.

Again, formulas have been developed on the basis of any one or more of these conditions applying to: (e) the entire volume of wastes; or (f) the excess in strength of the wastes over and above a stated normal sewage strength for a given community.

Volume alone is not a satisfactory basis for charge for handling wastes in a community system. There are many examples of liquid industrial wastes which are great in volume but very low in pollutional or disrupting strength, such as wash or cooling waters. These are relatively easy to handle and moderate in treatment cost. Other wastes may have a very small volume, but be excessively high in strength. Such wastes require a much more extensive and elaborate plant and much more expensive treatment. Therefore, to base a charge on volume alone will penalize the high-volume, low-strength producer and give an unfair advantage to the low-volume, high-strength producer.

Waste strength alone works in the opposite direction, for a charge based on waste strength units would penalize the low-volume, high-strength producer and favor the high-volume, low-strength producer. The same holds true of the chlorine demand charge.

A most equitable formula takes all three of these elements into consideration. This is the fairest method, and can be applied most equitably to all contributors. But points (e) and (f), are considerations to be taken into account also. It is possible to combine all of these elements into a workable formula for a given community, as is evidenced by those adopted by such cities in the United States as shown in Table No. 1.

A cooperative study by the officials of a community with the officials of local industry will serve to bring into the open all of the factors. With these factors of public requirements, local expediency and industrial rights and privileges, it is quite possible that a satisfactory basis of charging for handling industrial wastes in the local system can be arrived at, without recrimination and hard feeling, which frequently result when communities set up arbitrary rates without recognition of the industrial case. It is worth a try in the interest of public good will.

Remission of Taxes to Industry

The industries of any community usually contribute heavily in the form of real estate and other taxes levied by the community. They may add their share to all local fund raising campaigns, and usually one or more of their officials takes an active part in these campaigns. In some cases these industries will encourage their employees to contribute to local causes, and for the more worthy causes, may add materially to the employee contribution. Many

(*Continued on page* 98)

Table 1.—Developed Formulas for Charges for Wastes

Characteristic Included in Formula

City	V	BOD	SS	Cl	All SS	+ BOD	+ SS	T
Buffalo, N. Y.	■		■	■			■	
New Brunswick, N. J.	■		■	■	■			
Salinas, California	■		■	■		■	■	■
Wright Formula	■	■	■			■	■	
Gray Formula	■							■
Belleville, Ill.	■	■				■		
Allegheny County, Pa.	■	■	■	■		■	■	
Marion, Indiana	■							
Durban, S. Africa	■							
Baltimore County, Md.	■							
Dewsbury, England	■							
Halifax, England	■				■			

V = Volume; +BOD = excess BOD, +SS = excess SS, T = credit for taxes.

● **FACTORS considered by various cities in their charges for industrial wastes.**

WHY
Construction Equipment should be kept clean

● **STREET maintenance equipment, including trucks, shovel loaders and street sweepers are cleaned after use to keep them in top operating condition.**

ERNEST W. FAIR

ROAD machinery and equipment, and the engines that drive these units, require frequent thorough cleaning. Dirty equipment cannot be inspected and evaluated for parts that need replacement; efficiency in repair and overhaul is less; and there is always a good chance that a dirty piece of equipment will get slovenly work in the repair shop.

Just as surely, proper and adequate cleaning of every part of every unit is practical assurance that the useful life of the unit can be extended materially. Dirt, grease, oil and grime can cover a fault, or hide a needed adjustment, just as easily as it can conceal the part that is about to fail. Any shop not equipped with proper and complete cleaning equipment is automatically adding a sizable figure to its overhead costs, and to the overhead of the department it serves.

In those county and city repair shops where this matter has been given proper attention, all equipment units are cleaned, even for inspection. This is generally done through the use of one of the steam cleaning units on the market. Yet to rely solely on steam cleaning to do the job is as mistaken as it is to attempt to handle the equipment and parts cleaning problem with any other single method or methods. No one system will do everything.

When heavy units are brought into the shop, they are frequently caked with mud. This should be removed with a scraper, bar or shovel before the machine is brought up for final cleaning. High pressure streams of cold water also may be used to facilitate this work.

Most steam units are of the flash boiler type, consisting of a heated copper coil through which the water is passed. Some units have the advantage that a chemical cleaning agent can be introduced into the unit and applied to the machine with the steam. Oil or gas firing for steam production is most common and practical. The smaller units of this type convert 120 to 160 gallons of water to steam per hour. Experience has shown that in a shop of any considerable size, a capacity of about 240 gals. per hour is more satisfactory. The larger units produce a wetter steam which does a better or faster job of cleaning. Pressure varies among the units available, but averages around 80 psi.

Steam cleaners are used under rugged conditions in many shops and receive abuse frequently. Therefore a cleaner should be selected for its ruggedness, but also

for accessibility of parts so as to make maintenance of it as easy as possible. The location of the machine in the shop is important, because location may have much to do with the care it receives. If there is any part that is likely to cause trouble, the cleaning equipment should be so placed that regular and preventive maintenance of this part will be easy.

One of the parts that frequently needs attention is the pump that brings the water and chemical cleaning admixture to the steam generator. In some machines, there is a soap tank at the top and a valve for mixing the chemical into the feed. This valve benefits from preventive maintenance. On machines having blowers or other devices operated by a single motor, it is advisable to have this motor readily accessible.

Steam nozzles should be taken apart and inspected regularly. Waste of steam costs money, and reduction of steam pressure at this point can reduce the effectiveness of the cleaning procedure.

Other Types of Cleaners

High pressure water washers are also effective cleaners on tractors and other large equipment. A high pressure piston pump is the important unit in this type of cleaner. Pressure and volume must always be properly balanced in these cleaners if they are to operate at their highest efficiency. Usually this will be at near 400 psi with a volume of 12 to 14 gpm. This thrust will be about all that the operator can control. Actual practice in cleaning heavy road machinery has shown that a good unit of this type can clean in 4 to 6 hours where the steam unit would take 8 to 10 hours, all conditions being equal.

Where parts have become caked with soil-soaked dust over a considerable period of time, the application of a soluble oil type of solvent may be necessary. This should be allowed to stand for at least 20 minutes, preferably longer in difficult cases, after application. High-pressure water will then remove the caked substance easily. Solvents are generally diluted, depending on the kind used.

Vapor degreasing methods are useful for cleaning parts that are covered with engine oil, transmission oil or other lubricants. Vapor degreasing assures positive removal of deposits, which is necessary before a complete inspection of the parts for defects can be made. Inspection of any part, large or small, without thorough cleaning, is not a wise policy in any shop. Even the most experienced man can overlook a fault that is hidden by foreign matter still on the part, no matter how thin that coat of foreign matter may be.

The well-equipped shop should have cleaning equipment and methods available to handle every possible problem it will face. It is poor policy to attempt to do all cleaning work by any one method or system. While steam cleaning, for instance, can handle primary cleaning or large parts satisfactorily, there may be circumstances where it is of little value in doing an adequate job on small parts.

When proper cleaning equipment and methods have been adopted and installed, many dollars can be saved through lowered cost of maintenance, longer life of equipment, whether large or small, and in the budget of the maintenance shop itself.

Equipment Details

In order to make this article of maximum practical value to our readers, additional material on steam cleaners was obtained from Malsbary Mfg. Co., who are specialists in this equipment. The data from them follows:

In addition to removing dirt for easier inspection, steam cleaning is a quick, easy way of preparing equipment for repainting, welding and repair. Studies show that one man with a steam gun can do as much maintenance cleaning in one hour as a man with brush and bucket can do in 8 to 10 hours. Steam cleaning cuts as much as 40% off repair time, because it eliminates hand wiping off of grease and dirt on motor and chassis overhauls.

Steam cleaners are divided into two general types: steam vapor cleaners, which depend on steam for their working pressures and have a practical operating limit of 75 to 100 psi; and heavy-duty, high-pressure steam cleaners, which depend on pumps for working pressures and are capable of delivering hot solutions at 400 lbs. pressure. Which to use will depend largely on the type and number of machines to be cleaned and where the work will be done.

Here's the rule of thumb Malsbary uses when making recommenda-

(*Continued on page* 98)

● **ACCUMULATIONS of mud on earth moving equipment froze overnight, causing breakage. Steam cleaning stopped the trouble.**

Phoenix Averts a Water Famine

● **WATER FILTRATION plant on the Verde River has a treatment capacity of 30 MGD.**

DEAN SMITH

AT the beginning of the summer of 1951, the city of Phoenix, Arizona, was on the threshold of a serious domestic water famine. There were three good reasons for the situation. First, the Phoenix urban area had increased in population nearly 20% in two years and was estimated at that time to be 240,000, not including the nearby incorporated towns.

Second, central Arizona was nearing the end of a devastating 10-year drought that had reduced the Verde River—principal source of the Phoenix water supply—to a virtual trickle. Because of the low level of water in Salt River Valley Water Users storage lakes, major consumers were pumping so much water from underground sources that the water table had fallen alarmingly.

And third, increased industrialization and wider use of water-consuming household appliances had upped the per-capita usage of water.

Dario Travaini, superintendent of water and sewerage, warned the city administration that an alarming situation was developing. As a result, the engineering firm of Headman, Ferguson and Carollo, Phoenix, was engaged to make a comprehensive survey of the city water situation.

On July 17, 1951, the engineers made their appraisal: "Only abundant rainfall on the Verde River watershed can avert a water famine within a matter of days."

Already the maximum daily demand had exceeded 70 million gallons and the 1951 water facilities could produce only 69 million gallons per day. The difference was being made up by tapping a small reserve supply, but there was no assurance that the reserve would take care of the daily deficits for long.

A New Program

Headman, Ferguson and Carollo recommended that the city start work immediately on a three-phase program to avert the threatened water shortage. Phase I covers steps to improve the present supply and to increase the capacity to 83.5 mgd by 1953. Phase II aims at increasing the capacity to 129 mgd by 1970, and Phase III calls for an increase to 162 mgd by the year 2,000, when the Phoenix population is expected to reach the 400,000 mark.

At the time of the engineering survey, Phoenix had the following facilities in its water system, the capacity totalling 69 mgd:

(1) An infiltration gallery and 14 wells along the Verde River: capacity 20 mgd.

(2) A water filtration plant on the Verde: capacity 30 mgd.

(3) A field of eight wells eight miles northeast of Phoenix (near Scottsdale): capacity 19 mgd.

(4) A 30 mgd raw water pumping station on the Verde River.

(5) 25 miles of transmission mains used to carry water from the Verde and Scottsdale wells to Phoenix.

(6) A three-speed booster pumping station on the transmission main to increase the capacity of the main to a maximum of 60 mgd.

(7) Four distribution reservoirs, with total storage capacity of 55,000,000 gallons per day.

(8) About 1,000 miles of distribution mains.

(9) Variable speed booster pumps at the reservoirs capable of supplying rates of 120 mgd to the distribution system.

Because of the rapidly falling level of the underground water table, and the poor quality of the ground water, it was not feasible to depend on wells for any appreciable expansion of the Phoenix water system.

The solution to the problem, evidently, was to use, in conjunction with the Verde waters, the flow of the Salt River, which converges with the Verde 35 miles northeast of Phoenix, and the Arizona Canal, which carries irrigation water from both rivers to the farms of the Salt River Valley.

Both the Salt River and the Arizona Canal sources are under the control of the Salt River Valley Water Users Association. Negotiations between the City of Phoenix and the Water Users were started immediately and an agreement was reached which grants the city all the Salt River and Arizona Canal water its rapidly expanding population might require in future years. Payment for the water is to be at the rates charged to agricultural users.

The agreement is based on the fact that when the Salt River irri-

gation project was first developed in 1912 all the lands in the Salt River Valley, including those within the City of Phoenix, were under the project and were entitled to water. And domestic water has priority over irrigation water.

The newly-acquired water rights gave Phoenix the assurance of adequate water supplies for all of foreseeable future. In Arizona's driest year, 1902, the Salt and Verde Rivers carried 332,000 acre feet of water. Phoenix used only 41,666 acre feet in 1951 and engineers estimate the city will use about 71,400 acre feet in 1962.

New Projects

To use the Salt River and Arizona Canal waters, the Phoenix Water Department drew up plans for two major production facilities. One is a 40 mgd pumping station below the confluence of the Verde and Salt Rivers with a presettling basin. The water will be pumped back to the Verde filtration plant, which will be expanded to handle the larger load.

The other project is a 30 mgd pumping station; a pre-settling basin; a 30 mgd filter plant; and a new 20 mgd reservoir on the Arizona Canal.

The new installations will give Phoenix double water insurance—the existing Verde supply with its pipeline transmission system; and the Salt River-Arizona Canal supply, brought to Phoenix primarily through the canal. Should either of the parallel supplies fail, the other could carry the load.

At a special bond election on April 29, 1952, Phoenix voters approved the water system improvements listed below. The cost of these is estimated at a total of $7,000,000. The improvements are expected to provide an adequate water supply for the next ten years. Further improvements are planned by that time.

(1) A 40 mgd pumping station below the confluence of the Verde and Salt Rivers, with a pre-settling basin; 60-cycle power at the Verde pumping station; and enlargement of the capacity of the present filtration plant on the Verde from 30 to 40 mgd. The cost of these improvements will be $480,000.

(2) Increase in carrying capacity of the water transmission line from the Verde filter plant to city reservoir from 73 to 84 mgd, at a cost of $575,000.

(3) Construct a pre - settling basin, a 30 mgd pumping station, a 30 mgd filter plant and new 20,000,000 gallon reservoir, all on the Arizona Canal, at a cost of $2,511,000.

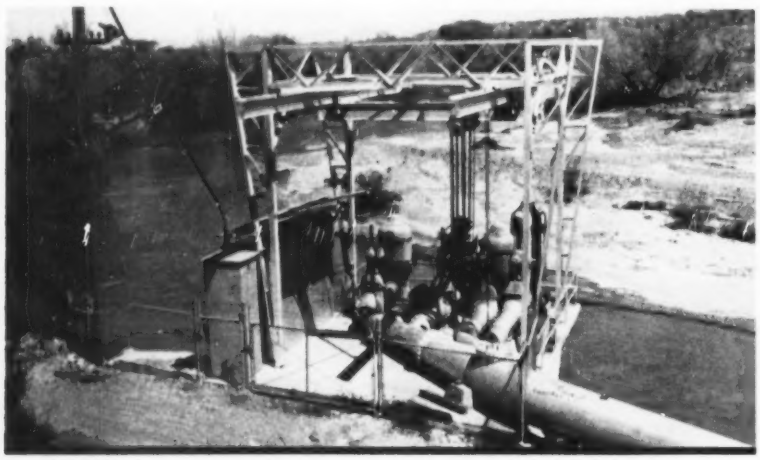
(4) Construct necessary transmission lines and feeder pipe lines to distribute the water supply now and in the future at adequate pressures. The cost for the work will be $2,262,000.

(5) Improve the distribution system, primarily for better fire protection. Estimated cost for this is $500,000.

(6) Replacement of old distribution pipe, principally on the south side of the city. Estimated cost $250,000.

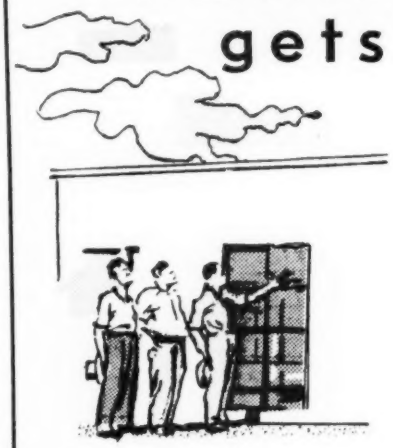
The engineering and legal fees and land purchase costs for this work are expected to total $422,000.

To finance the improvements, $3,500,000 in tax-secured general obligation bonds were sold by the city Sept. 16, 1952. Another $2,500,000 will be offered for sale in July, 1953, and the remaining $1,000,000 in July, 1954.



● **PRESENT pumping station situated on the Verde River handles raw water.**

Public gets



THE citizens of Ada, Okla., were tired of inadequate sewerage service. They were fed up with toilets that couldn't be flushed, and with sewage backing up into their homes. So they did something about it. They formed a Citizen's Committee to spread the word of why Ada needed a new sewer system. They printed leaflets, held meetings, got out the vote for the bond issue, and fought alongside of their engineers to see that the program was pushed through on a sound basis.

In the next few months Ada's new sewerage system will be completed. It will not only improve living conditions in that city, but it will stand as an example of a city's citizens speaking up for progress. Ada is a good case history of a new sewerage system, why it was needed and how it was obtained. More than one-fourth of the city did not have sewers, and home owners had to use septic tanks. There were continual troubles because soil absorption on many lots was entirely inadequate to assure functioning of the septic tanks. In fact, city-county health inspectors stopped construction of new homes in some areas because absorption tests showed that the soil was almost totally impervious.

Poor service was also the rule in the sewered portions of the city. There were areas where raw sewage flowed into streets and alleys; there were some blocks where sewage occasionally backed up into homes. The treatment plant was so overloaded that, at times, it had to be bypassed to prevent flooding. The bypassed sewage was discharged untreated into a small stream that runs through the northern part of

Relations Program Better Sewerage

the city. At the plant itself, sewage often stood ankle-deep from overflows; and, evaporating during dry weather, it contributed unwholesome odors to the adjacent areas.

An Engineer Helps

Ada's affairs took a turn for the better when the city called in a consulting engineer to furnish professional guidance. He surveyed the sewerage problem thoroughly. He found that sewers were overloaded in almost every locality. Infiltration added ground water to the already excessive load. Poor workmanship on joints and foundations in many of the older lines contributed to the difficulties. The existing treatment plant was hopelessly inadequate and below any reasonable health standards. For example, the sludge drying beds could properly serve a population of 7,900, whereas facilities for about 18,000 were actually needed at the time. The cramped location of the plant, only 5 blocks from the main business district, permitted of no expansion.

The consulting engineers recommended a $920,000 project to meet the needs, with reasonable provision for the future. Of this, labor costs were estimated to be about $250,000, construction costs to exceed half a million, and equipment costs to account for the remainder. The city council was well convinced of the need for action, but a program costing nearly a million dollars is not easy to initiate without a public demand, so the council waited for a public reaction.

About a year later, in Feb., 1950, a large group of citizens attended a council meeting and asked for action. This was approved and the next step was to call a public meeting. To this, some 32 organizations sent representatives, and 150 public-spirited citizens attended. The needs and the methods of filling these needs were explained. Many questions were answered. As a result, a Citizen's Committee was formed to sell the program for a new sewer system and treatment plant. Financing plans provided for bonds to be paid for by a tax against property owners and an assessment against property being sewered for the first time.

The public vote on the bond proposition was set for April 4, and the sewer bond issue was made the only one to be presented to the voters, so that it might stand or fall on its own merits. The Citizen's Committee printed leaflets which told in words and cartoons what was needed. Camp Fire Girls and Boy Scouts distributed these from door to door. Local doctors helped, too, by distributing leaflets from their waiting rooms. The Committee provided speakers for every possible local club meeting. The Valley View Hospital Auxiliary offered to pick up voters and deliver them to the polls; they even offered baby-sitting services. Local newspapers cooperated fully, giving complete publicity to the program.

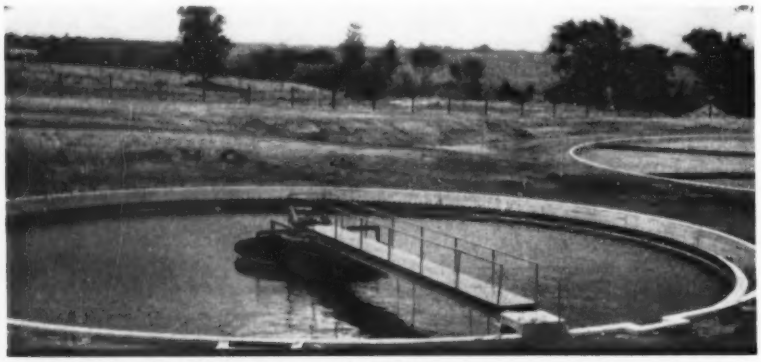
But the machinery did not run without a few misses. The main source of trouble was typical: It is difficult to get people to vote. The bulk of the sentiment was solidly for sewers, and it turned out that only 177 dissenting votes were cast. But in this lack of opposition lay much of the trouble. By noon of voting day, less than 200 people had voted. The committee women rallied and did some furious telephone work. Their efforts were enough to gain a favorable vote of 1072—still the lightest vote in the history of Ada. The bonds carried the interest rate, when sold, of only 1.869 per cent.

The Treatment Plant

Ralph W. Delaney, consulting engineer of Ada, designed the treatment plant, which was constructed by contract by Don Pray, Inc., of Monett, Mo. The engineer's estimate of cost was $349,504 and the final cost of the completed plant was $348,155. Construction work was finished in the late summer of 1952, at which time all of the sewage from the old sewer system was reaching the plant, and about half of the expected flow from the new lines. The remainder of the new sewer system will be completed about the first of 1953, and the plant

● **CONSTRUCTION VIEW of the Ada, Oklahoma, sewage treatment plant. Units include primary and secondary settling tanks, filter, digesters and sludge beds.**

● **CONSTRUCTION** of the new sewer system in Ada, Okla. A total of **128,000** feet of clay pipe, from 8" to 36" sizes, were used in this project.



● **SECONDARY SETTLING** tank installed at the sewage treatment plant.

● **THE COMMINUTOR** installation. Room for additional units is provided.

is so arranged that each increment can be brought into the plant as soon as completed. The plant was designed to serve a population of 30,000.

The plant provides complete treatment, with a comminutor, a Parshall flume and a detritor preceding the pumping station which delivers to the primary settling tank; a primary tank; a standard rate filter; a secondary settling tank; a two-stage heated digester; and sludge drying beds. All major equipment for the plant was furnished by The Dorr Co., except the pumps, which were Fairbanks, Morse, furnished by Sherman Machine & Iron Works of Oklahoma City. Wiring was done by Service Electric Company of Ada and sheet metal work by Howards Metal Co., also of Ada. The cast iron pipe was furnished by American Cast Iron Pipe Co. All clay pipe was supplied by W. S. Dickey Clay Mfg. Co.

The project also included a sewage lift station which was built by the city by force account at a cost of about a thousand dollars under the engineer's estimate.

John R. Hamman, city manager of Ada, furnished much of the information contained in this article; basic data on the sewer lines were furnished by David Skylar of the Sanitary Engineering Committee of the National Clay Pipe Mfrs. Association. Mrs. Mary Hughes Simpson, an engineer was employed by the city to have charge of costs and inventory. Everett Coats was job superintendent for Don Pray; and Homer Reed is operator of the plant.

• • •

Filter Operating Data at St. Louis

The St. Louis, Mo., Water Department, of which Thomas J. Skinker is Commissioner, operates the Howard Bend and the Chain of Rocks filter plants. The former has 20 filters; the latter 40. During the 1951-52 fiscal year, the Howard Bend plant operated its filters at an average rate of 78.12 million gallons an acre a day; the Chain of Rocks plant at 91.15 mgad. At the Howard Bend plant, the average run of the filters was 139 hours or 14.85 million gallons; the filters were washed at an average loss of head of 7.3 ft., and wash water averaged 0.71 per cent. At Chain of Rocks, the average filter run was 71.77 hours or 8.76 mg; filters were washed at an average loss of head of 8.76 ft.; and wash water averaged 1.16 per cent.

WOLVERINE COPPER WATER TUBE

in this..

HANDY CARTON

A tough, durable carton holds each coil of Wolverine copper water tube. As a result, the tube is protected, easy to store and to inventory, easy to merchandise and re-ship.

Buy from your Wholesaler

WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.
Manufacturers of tubing exclusively
1451 CENTRAL AVE. • DETROIT 9, MICHIGAN
Plants in Detroit, Mich. and Decatur, Ala.

Ask for **WOLVERINE** COPPER **TUBE** *by Name*

Export Department, 13 E. 40th St., New York 16, N. Y.

Thousands use our Readers' Service card to keep up to date . . . do you?

MACHINES DO THE WORK FASTER AND CHEAPER

GETTING THE JOB DONE AT A PRICE YOU CAN AFFORD AND IN THE TIME YOU CAN ALLOW

FOR HANDLING a snowfall which totalled 160 inches, our best equipment was a White loader on a DI Case tractor, using a 2½-yd. bucket. Our Seaman pulvimixer worked very well in cutting ice on streets. We made a V blade for our Austin-Western 99 grader. This fits on the scarifier and is used for tapering alleys to the centerline for drainage.—Karl G. Williams, Sup't. of Public Works, Glenwood Springs (2500), Colo.

ON SNOW removal, we used a Sno-Go loading snow windrowed by a Caterpillar 12 motor grader working from 2 AM to 4 AM; and from 4 AM to 8 AM, we loaded the snow. Colored lights on the Sno-Go indicated to the trucks to "back up" or "go ahead." M. E. Erkkila, City Engineer, Chisholm (6800), Minn.

SELF-LOADING TRUCK unit (made by Brisson) has been used for garbage pick-up on a regular schedule, and as an emergency vehicle for picking up sand for ice control and for windrowing snow. It was used approximately 2600 hours during the year, part of the time with a crew of two and part of the time with only one man. Calvin M. Lakin, City Manager, Norway (3500), Mich.

BEST ALL-AROUND piece of equipment is our new Barber-Greene loader. It served last winter as a snow loader (our heaviest snowfall in 25 years) and during the summer months we use it for all kinds of loading work. Patrick J. Whelan, City Engineer, Missoula (25,000), Mont.

FOR STREET SWEEPING, our Wayne sweeper has been excellent; and for street construction, our Adams motor grader.—Lee M. Roberts, City Administrator, Yuba City (8,000), Calif.

SNOW REMOVAL is where we use equipment most effectively. We have an A-C motor grader with Baker V plow and Tractomotive loader, a GMC 1½-ton truck with Baker one-way plow, and a Ford 1½-ton dump. F. K. Dawson, City Manager, Galena (4700), Ill.

SNOW REMOVAL — we purchased a Cyclone snow loader which speeded up work and cut costs in removing an unusually heavy snow fall of 65 ins. Robert L. Anderson, Sup't. of Public Works & Village Engineer, Winnetka (13,000), Ill.

FOR SNOW REMOVAL, we used a Caterpillar No. 12 grader to windrow and an Athey force feed loader, equipped with a snow belt, for loading the snow. W. R. Walter, City Engineer, Frederick (18,300), Md.

OUR STREETS were in a mess after a big blizzard, and a Sno-Go cleaned them up. Most of our public work is done under contract. We collect garbage, sweep streets, remove snow and do other routine work with city forces. Benton R. Anderson, City Engineer, Clinton (30,000), Iowa.

OUR FRONT-END loader has been used most effectively because of its versatility, permitting it to be used on numerous kinds of work. We use it for snow removal, materials handling, refuse collection and disposal and backfilling. Albert Gray, Jr., City Manager, Manistee (9000), Mich.

IN STREET AND CURB reconstruction, we used trucks, a shovel and a front-end crawler loader for excavation of both roadway and sidewalk; a large grader and roller for placing the gravel base, which was stabilized with calcium chloride. This was spread with a Burch Chipover. The bituminous concrete surface of Colprovia was laid with a Barber-Greene paver.—Wallace A. Howes, Sup't. of Streets, Northampton (29,000), Mass.

Shown in the photo above are W. E. Sealy, Superintendent of Water and Sewers, Lamesa, Texas, and three members of his maintenance crew. They are using Flexible sewer cleaning equipment, which is driven by a Briggs & Stratton engine. About 500 ft. of flexible rods are mounted on the trailer. Mr. Sealy says "We have been very successful in removing sand, grease and rags from our sewer lines with this equipment. It speeds up our work very materially."

WAYNE AND ELGIN sweepers have done fine work, in conjunction with Hough loaders on street cleaning work. We also used the Hough loaders for cleaning our filter basins. —Willard S. Pratt, Director of Public Works, Newton (85,000), Mass.

IN OUR LANDFILL, we use a Drott Bullclam on an International TD9. We have had this since 1946 and feel it is the most suitable piece of equipment available for this job. This year, we put a scarifier at the rear of the tractor as we hit hardpan about 54 to 60 inches down. If we had put this scarifier on at the beginning, we would have saved about 25 per cent wear and tear. It cost $600 installed.—Richard H. Ward, City Administrator, Turlock (6500), Calif.

OUR HYDROCRANE with clamshell is our most effective equipment. This is equipped with a tilt-bed trailer for use mainly in the Water Department. The crane lifts cast iron water pipe from the stock pile, lays it on the trailer and hauls it to the job site. Then it lifts the pipe from the trailer and places it in the trench. The clamshell was recently purchased to work on a sewer replacement job. It has been invaluable. It excavates the trench, places sheet piling, breaks and removes the old pipe, handles the new pipe into the trench, places concrete around the pipe and backfills the trench.—Maurice M. King, City Engineer and Director of Public Works, Santa Monica (74,000), Calif.

WHILE NOT A large operation, we have had considerable success with a Hydrauger boring machine for installing drains for the correction of landslides. This work has been under my personal supervision.—Earl M. Buckingham, Supervising Civil Engineer, Oakland (384,575), Calif.

THE EQUIPMENT used most effectively was a front-end truck loader with a 1¼-yd. bucket. Using this, eliminates the necessity for any additional equipment for truck loading, involving a substantial saving in labor and equipment. This equipment is also used in garbage removal when necessary. The loader is made by Brisson Bros. of Norway, Mich. The equipment was purchased for experimental purposes, but has proved very efficient. J. S. Metros, City Manager, Iron River, (4048), Mich.

DURING THE past year we purchased a Netco catch basin cleaner and find that we have reduced the cost of cleaning catch basins and, at the same time, have overcome our labor shortage problem in this field. Collins E. Thornton, Director of Public Service & City Engineer, Lansing (92,000), Mich.

A MALL AIR saw has been used effectively in tree removal in our city. This utilizes the same air compressor as that used to cut pavement openings.—E. L. P. Bloxam, Sup't. of Utilities, Bennettsville, S. C.

OUR FORDSON tractor with a loading shovel on the front and a blade on the rear is our most-used equipment. We use the shovel for loading anything we want to load, including concrete culverts, hydrants and materials. The hydraulic lift makes it easy to install or take out hydrants.—Melvin Anderson, Sup't. Water Dep't., Perryton, Texas.

WE USED a Ferguson front-end loader for removing stone from water main trenches, placing the water pipe and backfilling; and a truck body spreader for ice control. Leslie M. Willard, Sup't. of Public Works, Ayer (5,000), Mass.

OUR BEST USE of equipment was the purchase of a ⅜-yd. dragline to dig water and sewer trenches in place of renting such equipment or using hand labor to do the work. Norman W. Sageman, City Manager-Engineer, Cadillac (10,345), Mich.

FOR RUBBISH collection we use 10-yd. Wagner Scoopmobiles, and we employ a conveyor system for sorting and processing rubbish. D. E. Drummond, Ass't. Engineer, Highland Park (50,000), Mich.

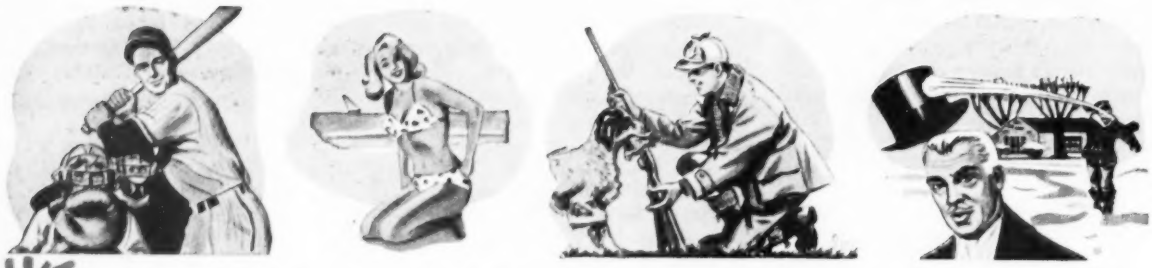
TAR MATTING was applied, during 1951, to 2.42 miles of street, using #6 tar mixed with gravel to a thickness of 2 ins. Cost per square yard was 28 cents. We have no asphalt plant and the ordinary turnover method was used. We also seal-coated 5.55 miles of street at a cost of 8.9 cents per sq. yd. B. E. Fieve, City Engineer, Steven Point (17,000), Wisc.

OUR AIR COMPRESSOR has many uses. We employ it with a clay spade to dig out water and sewer lines. The soil here is very hard when dry and a power digger saves much labor. We use it also for calking lead joints on water lines—it has the same power to its blow at the end of the day as at the beginning. With a jackhammer, we use it to excavate rock, break open pavements and set parking meters in the sidewalks. And we use it to blow out potholes in pavements so that the patch is put in properly.—Charles W. Gallaher, City Engineer, Lawton (40,000), Okla.

(*Please turn to page* 84)

Cleveland's Crash Truck Does Many Jobs

THE new "crash" truck put into service by the city of Cleveland, O., is really an all-purpose disaster unit. It is a tow truck for extra-heavy towing jobs; it can handle a dead weight up to 60 tons; it has two big booms that swing 170°. It can pull down walls, pick up an overturned tractor-trailer unit and do many other similar jobs. It weighs 18 tons and is equipped with acetylene cutting torches, hydraulic push-pull equipment, blocks and tackles and fire-fighting and first aid materials. Provision is made for attaching a snow plow. The truck is radio-controlled. It was designed and built through the cooperation of the City of Cleveland's Division of Motor Vehicles, the White Motor Co. and the Simmons Automotive Equipment Co., also of Cleveland. It is a model WC-2864 TDW White with 185½-inch wheelbase, a 200-hp Cummins diesel engine, auxiliary transmission, power steering and 12.00 x 24 tires. Frank M. Cunningham is Commissioner of Motor Vehicles and Frank J. Velchek is Assistant Commissioner.



LIKE Spring and Baseball...Summer and Swimming...Autumn and Hunting...Winter and Snowballs

Yes, whether it's pulling a wet ditch, with the rear drivers up where the footing is good; or finishing a wide shoulder without leaving tire marks; or reaching out for a tremendous windrow and missing it with all wheels; or steering the rear wheels against the side thrust when widening out... whatever the season... whatever the job... All-Wheel Drive and All-Wheel Steer work together as a team... each making the other just that much more effective.

NO TWO WAYS ABOUT IT . . . an Austin-Western Power Grader goes places where ordinary motor graders cannot go... does things they cannot do... saves time and money on every job.

Austin-Western
Power Graders
Road Rollers · Motor Sweepers

BALDWIN BLH LIMA-HAMILTON
Construction Equipment Division

Manufactured by
AUSTIN-WESTERN COMPANY
Subsidiary of Baldwin-Lima-Hamilton Corporation
AURORA, ILLINOIS, U.S.A.

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

VICE PRESIDENTS
MILTON OFFNER
EDWARD P. DECHER
RALPH C. GRAHAM
WARREN A. COOLIDGE
PAST PRESIDENT
EDWARD J. CLEARY

A P W A
news
AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60TH ST., CHICAGO 37, ILL.

DIRECTORS
J. J. DEAN
SOL ELLENSON
GEORGE G. HYLAND
JEAN L. VINCENZ
TREASURER
ALBERT G. WYLER

ALLAN H. ROGERS, *President*
DONALD F. HERRICK, *Executive Director*

Saws for Making Concrete Pavement Cuts

WHILE the use of concrete saws in controlling pavement breakage when making service cuts or other openings in concrete pavements is a relatively new procedure, it is already becoming widely accepted. The development of this practice has been closely followed, and with much interest. Field observations indicate it to be particularly advantageous where openings in concrete pavements are to be replaced with concrete.

"Saw controlled breakage", as the term is used, means saw-cutting the pavement opening outline to a depth of about one-fourth the slab thickness prior to breaking out with some type of mechanical breaker. Experience with various depths of contraction joints in concrete pavements has shown that a cut of this depth is sufficient to control breakage. Actual trial cuts on the project may permit a reduction in the depth of cut, which can be safely used.

Opening The Cut

A number of types and models of concrete saws and mechanical breakers are being used for opening concrete pavements. There are, however, preferable procedures to be used in breaking out between sawn outlines in order to produce a face as nearly vertical as possible and to reduce underbreakage.

Since only about one-fourth of the slab thickness is cut, the remaining three-fourths presents a rough irregular face. It is this irregularity which will act to key the new concrete patch to the old pavement and to transfer loads across it, exactly as aggregate interlock does across planned contraction joints.

Observation of a great many concrete service cut patches in pavements indicates a crack is likely to form at the juncture of the patch with the old slab on at least one side, except where extremely narrow openings are involved. As service cuts are normally only a few feet in width, concrete drying shrinkage is much less than in slabs where joints are spaced 15 ft. apart. These cracks should, therefore, be narrower and, other things being equal, offer better load transfer than that normally provided by aggregate interlock across a contraction joint. While breaking out methods may vary somewhat when using different types of equipment, an initial break is usually made midway between the outline cuts. Two final passes are made on the sides to break to the cuts. This is done to minimize underbreakage and to provide a rough face below the cut, as nearly vertical as possible.

The saw cut provides a clean vertical face at the surface. This reduces the spalling or ravelling which often accompanies any opening method which may produce "feathered" edges. In Fig. I may be seen two service cut patches side by side on the same pavement, one constructed using a saw to control breakage. Note the clean spall-free outline of this patch.

Some agencies install concrete patches of greater thickness than that of the pavement being replaced. In some cases, this is done as a safety factor, in case proper compaction is not obtained. In other instances, this practice is followed where old thin concrete residential streets are to be patched. Concrete strengths under normal field conditions continue to increase beyond 28 days. Often old, relatively thin concrete pavements are satisfactorily handling traffic loads beyond

John McNerney of the Portland Cement Association presented this paper at a meeting of the Southern California chapter of the American Public Works Association.

● **FIG. 1—Note spall-free outline of patch at left. A saw cut was made, before the pavement was broken, to a depth about one-fourth slab thickness.**

those that could be safely carried by equal thicknesses of concrete pavement at early ages.

Occasionally an engineer has expressed concern over the possible intrusion of water through shrinkage cracks that may develop at the patch edges. Where properly designed concrete mixtures and correct placement methods are used, any such cracks are so narrow that sealing is unnecessary.

Probably the biggest single factor behind the successful patching of service cuts in pavements is proper compaction of backfill. The loss of subgrade support due to settlement or shrinkage can seriously affect the performance of any pavement. The importance of satisfactorily compacting trench backfill bears stressing.

The Concrete Patch

Due to the small size of the job, sometimes fundamental principles are neglected in construction of concrete patches. Care in designing and controlling the concrete mix and in placing it is just as important as in a full scale paving project.

The concrete, of course, may be mixed on the project or in transit mixers. Aggregate gradings and mix proportions should conform to those used for paving concrete, although it is recommended that the maximum size of aggregate be limited to 1½-in. Cement content ordinarily need not be above that normally used for paving concrete with the locally available aggregate. With 1½-in. maximum aggregate, this would usually be about 6 sacks of cement per cu. yd.

Quite often it is necessary to subject patched areas to traffic as soon as possible. Where this must be done, higher concrete strengths can be produced at early ages by using 2 lbs. of calcium chloride per sack of cement in the mix, or with Type III cement (High-Early-Strength), if it is available.

Fig. 2 shows the age-strength relation for normal and high-early-strength portland cements. It will be noted that one-day and three-day strengths, using high-early-strength cement, are about equal to three-day and seven-day strengths respectively using normal cements.

The percent increase of compressive strength of concrete with a 2 percent admixture of calcium chloride is as follows, based on a 1:2:4 mix, 6½ gals. of water per sack of

(*Please turn to page* 92)

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

Preliminary estimates of the U. S. Labor Department's Bureau of Labor Statistics and the Building Materials Division of the U.S. Department of Commerce indicate that a record volume of $32.3 billion was spent for new construction in 1952. Of this amount, public expenditures for new construction reached $10.5 billion, up $1⅓ billion from 1951.

Public expenditures for industrial-type construction registered a greater dollar increase over the year than did any other segment of the entire construction industry. This is attributable, in part, to huge public outlays for atomic energy construction.

Relaxation of Regulations

NPA's announcement on December 10, 1952 of the relaxation of construction regulations on January 1, 1953 was greeted by pubic works officials with enthusiasm.

These actions were taken in an amendment to Direction 8 to revised CMP Regulation 6 and an amendment to Order M-77, represents "The most significant easing of construction controls" by the National Production Authority of the U.S. Department of Commerce "since the institution of the original construction order on October 26, 1950," NPA has stated. The relaxations, effective January 1, 1953, increase the amounts of steel and copper that may be self-authorized for commercial and most other types of construction. The ban on hospital, recreational, public works, entertainment, school and amusement construction also was lifted. The action originally was scheduled for May 1, 1953. The relaxations on aluminum will not become effective until May 1.

NPA 1952 Review

"Building materials requirements for recreational, amusement and entertainment construction, banned for more than two years, can be met without interfering with supplies for the $33⅓ billion of other types of construction activity estimated for 1953," John L. Haynes, Director of the Building Materials Division of the National Production Authority, Department of Commerce, forecast.

"Erection of bowling alleys, skating rinks, swimming pools, playgrounds and other places of recreation in 1953 may amount to a value of one-quarter billion dollars. New construction activity has not been permitted for such structures in the period October 26, 1950-January 1, 1953, so that all possible structural steel could be made available for industrial expansion and other defense construction."

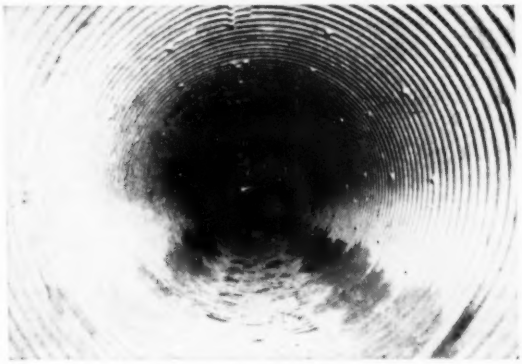
Reviewing the work of the Building Materials Division of NPA in 1952, the Director stated his group allotted almost four million tons of steel, about 300 million pounds of copper and 350 million pounds of aluminum to the approximately 6,000 manufacturers in the building components field.

Amounts of controlled materials allotted to different product groups, or "codes," have varied according to the product's scarcity and its part in the defense build-up.

Steel, for instance, was allotted in the fourth quarter, 1952, at a level of 60 percent of base usage (first half, 1950) for most products. Reinforced concrete pipe was supported with allottments of slightly more than 100 percent.

"Transition of house trailers, from a vacation and tourist product into a semi-permanent defense housing adjunct, has been noteworthy within 1952," Mr. Haynes commented. "New installations such as the Savannah River AEC project rely heavily on trailer villages to house their workers. So strong has this transition become that about 90 percent of house trailer output now serves the living needs of expanding defense industries."

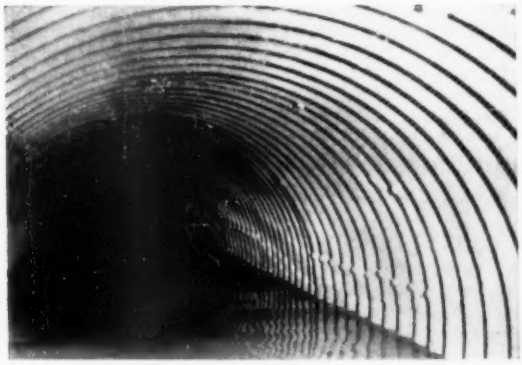
A guide for voluntary revision



This 36-inch diameter Armco Sewer was recently inspected in a mountain state city.

Large diameter Armco Sewer installed in a midwest city.

This Armco Storm Sewer in a midwest city is of 14-gage, 36 inches in diameter.



A large southern city installed this 30-inch diameter Armco Sewer Structure.

Which sewer has been installed 46 years?

Hard to tell, even from these recent photos, isn't it?

Actually, you can't tell the age of an Armco Sewer just by looking at it. Armco Corrugated Metal Sewer Structures have an outstanding record for long, economical and efficient service.

But in case you are wondering, the Armco Sewer in upper left has been in service 36 years; in upper right, 23 years; in lower left, 46 years; and in lower right, 28 years. How close did you guess?

Long life is not the only advantage of Armco Sewer Structures: Corrugated metal design provides ample strength for any loading condition. Long lengths speed up installation. Sturdy coupling bands assure tight joints and a continuous conduit. Choice of protective coatings and pavements helps meet severe corrosion and erosion. Size and capacity problems are easily solved within the wide range of sizes and types of Armco Sewers. And unskilled labor can handle the job, saving money at every step.

Write us now for complete data on your specific needs. Armco Drainage & Metal Products, Inc., 1603 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO SEWER STRUCTURES

ARMCO

Now's the time to mail this month's Readers' Service card.

of the 1700 divergent local plumbing codes, the National Plumbing Code was accepted by late 1952 by all the leading plumbing associations. Seven States—Arkansas, Colorado, Florida, Kansas, Louisiana, New York and Washington — have endorsed the code and more than 900 cities and towns have adopted it. Agencies of the Federal Government such as the Department of Defense, Veterans Bureau, Department of Agriculture and the housing agencies also use the code in their construction designs. This code was developed by the Department of Commerce and the Housing and Home Finance Agency. NPA's Building Materials Division now is charged with keeping it up to date.

Water and Sewage Projects

Approval of 703 water and sewerage construction projects with a total value of $343,025,641 in the third quarter of 1952 has been announced by the NPA. All of these projects were granted construction permits and received allotments of controlled materials.

Of the 703 construction jobs authorized, 450 were for waterworks and 253 for sewerage. Water projects are valued at $215,570,241 and sewerage construction at $127,455,400. These amounts include estimated cost of all materials, labor and engineering, James C. Crenshaw, Director of the Water Resources Division, explained.

New York headed the third quarter construction approvals with the greatest dollar value—$85,860,994—while California had the greatest number of projects approved. The Pacific State's 116 approved jobs had an estimated aggregate cost of $41,446,605, while New York had a total of only 35 projects authorized.

Ranking second in dollar value was Michigan with $55,366,806 for 37 approved projects.

Machines Work Faster

(*Continued from page* 79)

REPLACING AN OLD bridge which was washed out by spring floods was probably our most interesting job. Our power shovel was used to clear the debris and prepare for the excavation for a 48-inch relief line above the existing bridge which is adequate for normal rainfall. The shovel was used to handle the tile and lay it in place using an attachment made in our city garage. —George Meholick, Jr., City Manager-Engineer, Wakefield (3600), Michigan.

A CASE VAI tractor with Lull loader and a rear scraper blade was used for dressing ditch lines on unimproved streets. The loader follows the grader down the street and removes excess dirt. Then the loader and the rear blade dress the backslopes where water and gas utility shutoffs are located. This loader with rear blade is very flexible and does a lot of work.—Robert J. McNutt, City Manager and City Engineer, Hazel Park (20,000), Michigan.

WITH OUR SEAMAN mixer, we constructed 50,000 sq. yds. of asphalt emulsion park roads.—Harry A. Hoxie, Director of Public Works, Dearborn (110,000), Michigan.

A 7-YD. TOURNAPULL was used on beach renovation and for trenching for water and sewer lines in beach sand; also for filling in a swampy area for a ball diamond and a roadway. Haul was about one-fourth mile. We used a IHC TD14 for pusher in the loading area.—Samuel B. Wells, Acting City Engineer, Benton Harbor (18,000), Mich.

FOR SEWER work, we have used a backhoe and bulldozer; for road work, the backhoe for excavation and a roller, grader and paver. We contemplate buying a front-end loader and a street sweeper within the next two years. George A. Valente, Borough Engineer, Caldwell (7000), N. J.

OUR HOUGH Payloader is one of the most valuable pieces of equipment we have. It is working every day, as different city departments use it for all kinds of work. Last winter it was most helpful in snow loading.—Robert A. Glines, Town Engineer, Danvers (15,700), Mass.

OUR MAINTENANCE forces are doing good work with a 112 grader and a D4 high loader, along with two to four dump trucks. We not only do our maintenance grading but also grade streets in new additions where surfacing is to follow by contract.—H. M. Sheridan, City Engineer, Lawrence (20,000), Kans.

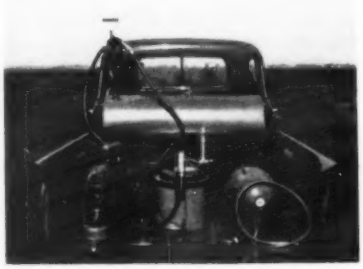
OUR MOST EFFECTIVE use of equipment was made in our sewer cleaning program and in street grading. For sewer cleaning, we use Flexible equipment with a 2-hp power drive for both the rod and the cable bucket. Street grading was accelerated by getting a larger road patrol equipped with a scarifier. Our Ford-Wagner tractor loader is too light for extensive dirt and gravel work, but is excellent for snow loading.—John E. Whiting, City Engineer, Jefferson (4300), Iowa.

AN EAGLE LOADER was highly effective on street excavation. The first step was windrowing with a motor patrol; then the dirt was loaded into trucks.—Clark Murphy, City Engineer, Nampa (17,000), Idaho.

WHEN AN 18-inch drain line caved in, we used a drag line to dig down to the old pipe. We had to clear the trench and work fast be-

Mobile Field Servicing Unit

TO reduce "down-time" on equipment and to keep it properly lubricated and maintained, a completely mobile servicing unit can be installed in any pick-up truck. The unit consists of a 120-gallon gasoline tank, with a hand pump and hose; an air compressor by Tokheim, a pressure lubricator and an air storage tank. The lubricator can dispense 350 shots of grease. The air equipment provides 150 lbs. working pressure and can be used for inflating tires, spray painting and dusting.



It is especially useful for proper on-the-job care of graders, cranes, tractors, trucks and other construction and maintenance equipment. When not needed, the servicing unit can be removed and the truck used for other purposes. This useful equipment was developed by the Fargo Foundry Co., Fargo, N. D.

that only C-P-P* meets the BIG 3 REQUIREMENTS

Only Concrete Pressure Pipe meets *all* of the "Big 3" requirements for ideal high pressure water lines. 1. Long life. 2. Sustained high carrying capacity. 3. Great structural strength. Rochester, N. Y. wanted all three for its new 45,000 foot supply line, *because former lines did not meet all three requirements.* So they turned to Price Prestressed Concrete Cylinder Pipe. Here's how they figured.

1. *Long life.* With Price Prestressed Pipe, only *concrete* is exposed. When buried in the ground, concrete is ageless as limestone—life is measured in centuries.

2. *Sustained capacity.* Properly placed concrete has the highest flow coefficient of any pressure pipe structural material—will never corrode or tuberculate under ordinary conditions. The concrete core is there "for good", because it is a structural part of the pipe. Prestressed Pipe offers continued high flow with no maintenance cost.

3 *High beam strength.* Price Prestressed Pipe makes your water line safe from external loads. It is shatterproof—and sudden and complete failure is all but impossible.

Don't overlook the other advantages of Price Pipe. *It's easy to lay*—can be installed quickly and easily because of its simple, self-centering joint. *It's easy to tap*—any service man does the job with regular equipment and a few accessories. *It's watertight*—the rubber and steel flexible joint adjusts to expansion, contraction, vibration and external loads without leaking. *It has great economy*—because of low original cost, low maintenance and extra-long, trouble-free life.

Are your present water lines as ageless as limestone? Do they carry as much water as the day they were installed? Are they free from sudden bursting and resulting floods? If not, learn all about Price Prestressed Pipe—with its steel cylinder plus an encasement of concrete inside and out. Our engineers know pipe line problems. Call them today.

* only CONCRETE PRESSURE PIPE MEETS THE BIG 3 REQUIREMENTS
• LONG LIFE
• SUSTAINED CAPACITY
• GREAT STRENGTH

Price Brothers Company

1808 East Monument Avenue, Dayton 1, Ohio

Please send me, without obligation, the following literature:

☐ Rochester's new water supply line
☐ Complete facts on Prestressed Pipe

Name_____
Organization_____
Street_____
City_____ State_____

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

cause the soil was poor—almost quicksand.. Backfilling was with a D8 tractor-bulldozer.—J. L. Morris, City Engineer, Boise City (35,000), Idaho.

IN RESURFACING older streets, our Street Department scarified the old oil-treated surfaces with our Galion grader and Caterpillar bulldozer. Poor material—ashes, loam, etc., found in many of these old streets—was removed. Good material was windrowed to one side and as subbase guides were established, was put back for a base. When necessary, trap rock was added. In this work, trucks, bulldozer, Hough loader and grader were fine. Surfacing was done by contract. We installed a 2-inch base and a 1-inch surface of bituminous concrete.—George J. Penny, Director of Public Works, East Hartford (30,000), Conn.

OUR MOST USEFUL equipment: Barber-Greene paving plant; Adnun paver; LeRoi compressor; Guttersnipe Model E street sweeper; Quick-Way shovel; International tractor with Hough loader; and D4 Caterpillar tractor.—George H. Russell, City-County Engineer, Lamar (8,000), Colo.

OUR REFUSE GETTER, during 1951, made 52,208 pick-ups of compactible garbage, amounting to 5,304 cu. yds., at a cost of $1.35 per cubic yard, or 12 cents per pick-up. This "Leachmaster" is an excellent machine. We have recently purchased a Model 1000 Wilshire sweeper; it is a honey and does an excellent job.—Col. John R. Hellams, City Manager, Avondale Estates (1500), Georgia.

THE FOLLOWING equipment has been very useful; Drag line, backhoe, and ditcher for sewer lines; road patrol, Seaman mixer, distributor and spreader for paving; and, of course, trucks for all work.—Henry P. Derry, City Engineer, Albany (40,000), Ga.

AFTER SEALCOATING with ¼-in. stone, we used a Wayne sweeper very successfully to pick up the excess stone.—Donald A. Robb, Sup't. of Public Works, Longmeadow (8,000), Mass.

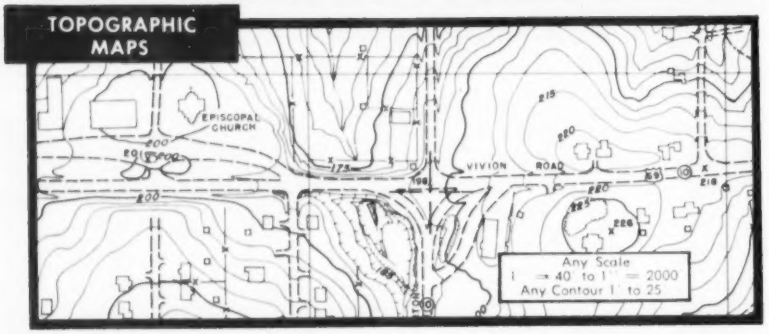
A DRAGLINE, ½-cu. yd. capacity, was used most effectively to clean a seriously contaminated open ditch 1½ miles long, using a skimmer scoop; and this equipment was also used to clean sludge beds. C. V. Windsor, City Engineer, Anderson (50,000), Ind.

THIS CITY does its own street paving, 27, 30 and 36-ft. widths of concrete, with curbs. We use ready-mixed concrete and Austin-Western grader, Allis-Chalmers tractor with scoop, Hough front-end loader, air compressor and attachments, Ferguson tandem roller, Jackson vibrating screed, Stow vibrator and steel forms. Doyle Miller, City Engineer, Moberly (13,000), Mo.

OUR MOST USEFUL equipment—a motor grader and an asphalt distributor. We have 20 miles of gravel and clay streets. We are grading, cleaning, applying MC-3, covering with graded trap rock chips, brooming and rolling. This eliminates dust and saves maintenance costs. J. F. Kilpatrick, City Engineer, Rolla (10,000), Mo.

SMALL EQUIPMENT has been used most effectively in bringing to grade streets that have been off grade for many years. This small equipment includes a crawler

The SUCCESS
OF YOUR PROJECT DEPENDS UPON THE ACCURACY AND COMPLETENESS OF YOUR BASIC MAP INFORMATION



With proper maps, planners and engineers have at their finger tips, the answers to many of the problems of sewer, waterworks, drainage, flood control, street alignment, and expressway location.

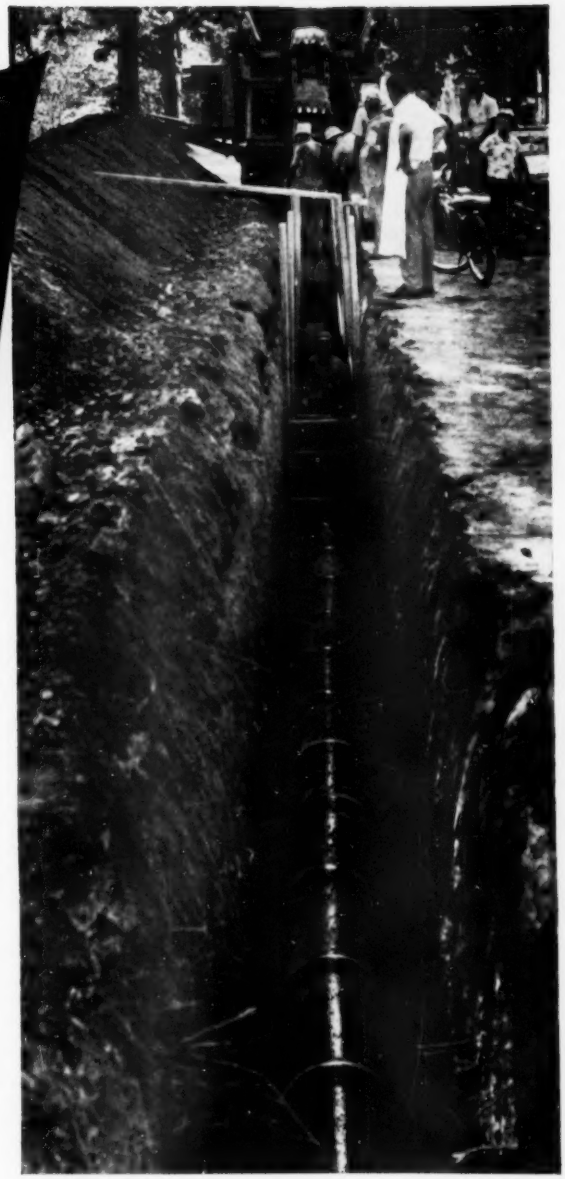
Whatever your project, you will find that good maps pay dividends — and when produced by Jack Ammann Photogrammetric methods you will have them in less time and at a saving in cost. Write today for brochure.

Jack Ammann
PHOTOGRAMMETRIC ENGINEERS
BROADWAY AT TENTH · SAN ANTONIO 5, TEXAS
AIR SURVEYS—MAPS

Eastern Office: 32 Hillcrest • P. O. Box 411 • Phone Manhasset 7-1840 • Manhasset, N. Y.

Get full details of this month's new products . . . mail your Readers' Service card today.

Evansville Installs CLAY PIPE IN $5,000,000 "URBAN HEALTH INSURANCE" PROGRAM



Over 50,000 newcomers to booming Evansville, Ind., get permanent sewerage facilities as more than 37 miles of Vitrified Clay Pipe are installed under a bond-financed program that includes the city's first sewage treatment plant.

"Urban Health Insurance"—that's what Evansville, Ind., newspapers call the $5,000,000 Clay Pipe sewerage project that will serve the new homes, schools, and hospitals within the expanding city limits. Defense industries have drawn more than 50,000 people into Evansville in recent years. The 200,000-foot Vitrified Clay Pipe installation provides them with *permanent* sewerage protection.

Clay Pipe is first choice of city engineers and building contractors all over the country, because it's *guaranteed for 50 years.* Clay Pipe can't be corroded or weakened by strong detergents, corrosive fluids, sewage gases, or electrolytic soils. It never "ovals" or squashes out. And it meets the needs of the future . . . can't be affected by wastes from home garbage disposal units or new industries. Whenever you specify, buy, or install sewer pipe, be sure it's Vitrified Clay — the pipe that *never wears out!*

NATIONAL CLAY PIPE MANUFACTURERS, INC.
1520 18th St. N. W., Washington 6, D. C.
206 Connally Bldg., Atlanta 3, Ga.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
703 Ninth & Hill Bldg., Los Angeles 15, Calif.
311 High Long Bldg., 5 E. Long St., Columbus 15, Ohio

Vitrified
CLAY
CLAY PIPE NEVER WEARS OUT!
PIPE

ESSENTIAL • ECONOMICAL • EVERLASTING

C-153-3

Thousands use our Readers' Service card to keep up to date . . . do you?

tractor with 1-yd. high lift loader, four dump trucks and a motor grader. The loader is also used effectively for loading quarry spoil for bases for these streets. Alfred H. Beck, City Engineer, Washington (7000), Mo.

NOT WHAT kind of a job, but the kind of equipment. We bought an Allis-Chalmers motor grader with a tractomotive loader mounted on it and it is the handiest implement we have. It is used on some job every day. F. F. Palmer, City Engineer, Forsyth (2000), Mo.

FRONT-END LOADER on I-TD6 tractor is used for following up street sweeper and loading sweepings, for cleaning gutters, for loading sand trucks in the winter, for loading gravel and for cleaning up excavations and backfill in streets. Rudolph K. Genthner, Sup't. of Public Works, Canandaigua (10,000), N. Y.

LEAF COLLECTOR is used to pick up leaves in the fall. By mutual arrangement of schedules, this machine does all of this work for three other communities, also. Rentals will pay for the machine in 4 years. Ernest L. Neumann, City Manager, Petoskey (6468), Mich.

HOUGH LOADER was our most effective equipment. We used this in loading out windrowed material on a series of grade changes. Two hills were cut down by a motor grader, and the loader was used for picking up the material. Other grade changes and shoulder improvement jobs were handled in the same way. F. N. Jackson, City Manager, Rogers City (3873), Mich.

NOW INSTALLING a storm sewer using a Minneapolis-Moline RT1 tractor with Henry BA8 backhoe and Lull 4-A loader. Robert A. Fricke, City Superintendent, Zeeland (3652), Mich.

A Survey on Practices in Garbage and Refuse COLLECTION AND DISPOSAL

To obtain information on garbage and refuse collection and disposal practices, a comprehensive questionnaire was sent to all member cities of the League of Wisconsin Municipalities. Only a few small communities were not included in the survey results which were published in "The Municipality", organ of the League and which form the basis for this article. Replies were received from 152 cities.

An increasing number of cities apparently are finding it necessary to provide municipal collections of garbage and refuse. While 32 cities collected garbage and refuse by city forces in 1936, 78 (51 percent of the 152 reporting cities) now provide complete municipal collection of garbage and refuse in both business and residential areas. In 20 other cities there is provided some form of municipal collection, such as garbage only or refuse only, or from residences and not from businesses. Over 2/3 of those cities with populations exceeding 5,000 provide some form of municipal collection.

The number of cities which arrange for a municipal contractor to perform collections has declined from 13% to 5% during the last 16 years. In 8 cities the contractor method is used for garbage and refuse collections from both business and residential areas; in 6 other communities a contractor collects garbage only.

Municipally licensed scavengers providing complete collections are found in only 8 Wisconsin cities, including 5 cities with populations exceeding 5,000. Some form of licensed scavenger collection is used in 3 other cities.

Private unlicensed scavengers provide complete collections in 18 cities, about 12% of the total. Only 3 cities with over 5,000 population use the private scavenger method of collection.

In only 12 of the 152 reporting cities, about 8%, are individuals in both business and residential areas required to remove their own garbage and refuse. Businesses are required to remove their own garbage and refuse in 6 cities.

Collection Methods

Combined collections.—Of the 85 cities which collect both garbage and refuse with city forces, 71 report the use of combined collections. Most smaller communities do not separately collect garbage and refuse. Cities using the sanitary landfill method of disposal often combine collections, while hog-feeding cities separately collect garbage. Cities using the incineration method of disposal generally classify wastes into burnable and nonburnable and collect the 2 kinds separately.

Collection agency. — The city agency or department making collections is most frequently the street department, often under the supervision of a council street committee. In those cities which have centralized public works activities, collections are usually made by a division of the public works department.

Personnel and equipment.—In larger cities where a substantial amount of manhours and equipment is required to perform collections, specific personnel and equipment is generally assigned exclusively to collection activities. This is true in nearly all cities with a population of over 5,000 which have municipal collections. In contrast, few communities under 3,000 assign specific personnel and equipment to collection activities, for they do not possess the limited-use, specialized equipment normally intended for such work.

Collection Data

Refuse.—Weekly refuse collection is the most common practice, with nearly half of the cities collecting business refuse weekly and over two-thirds of them residential refuse. Twice-a-week collection is the next most common practice; few cities remove refuse less frequently than weekly.

Garbage. — Twice-a-week business garbage collection occurs in 39 percent of the cities. Daily removal is provided by 15 cities. Over two-thirds of the cities provide weekly garbage collection from residences, while most of the others have twice-weekly collections.

Pickup Place.—The place where garbage is picked up varies quite widely. Alley pickups are usually made where possible, but curb collection is the prevailing method in residential areas. Backdoor collection of residential garbage was reported in 20 percent of the cities with municipal or contractor collections.

Limits.—Only 40 percent of the cities reported any limits on the amount, size or type of refuse collected. The most common restriction is that no brush or large tree branches will be picked up, or that such material must be in bundles not exceeding a specified size. Some communities collect no industrial or building wastes, and others prohibit placing poisonous material in the wastes. Several cities collect only refuse which can be placed in containers of a specified size.

Man-Hours.—The average man-

GRADING— The traction and digging power of the Model HM "PAYLOADER" easily cuts grade on this street paving job in spite of the many tree roots encountered.

SNOW REMOVAL— Loading snow with the bucket, or plowing it with "V" plow or one-way plow attachments the "PAYLOADER" is a versatile, powerful snow fighter.

LOADING — Full operator visibility and power-boosted steering makes the "PAYLOADER" a fast, nimble machine for loading trucks even in busy streets and other confined areas.

PITS & STOCKPILES — Whether stripping overburden, digging, loading or stockpiling, you can depend on the power and traction of 4-wheel drive "PAYLOADERS" to do a fast, efficient job.

MASTER OF MANY JOBS

Four-wheel drive "PAYLOADER" tractor-shovels are capable *and* versatile — able to do *many* street, road, pit, stockpile and yard operations. They drive quickly to the job at speeds up to 17 m.p.h. Big tires, plus 4-wheel-drive, gives them catlike traction and flotation on sand, snow and mud. Power-boosted steering makes them maneuverable and easy to handle . . . four gear ratios in each direction provide the right speeds to fit each task.

4-wheel-drive "PAYLOADER'S" are available in 1½ and 1 cu. yd. sizes. Five other "PAYLOADERS" from 1¼ cu. yd. down to 12 cu. ft. capacity, including rear wheel and front wheel drive types, are available to meet every tractor-shovel need. Your Hough Distributor, one of 200 in the U.S. and Canada, is set up to serve you *right* — with extensive application experience and complete parts and service facilities. The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Ill.

WRITE for full information on any of the "PAYLOADER" models: FourWheel Drive HM — 1½ yd. and HR — 1 yd.; Rear Wheel Drive Models HY — 1¼ yd., HF — ¾ yd., HE — ½ yd.; Front wheel drive Models HAH — 15 cu. ft., HA — 12 cu. ft.

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. SINCE 1920

hours per week devoted to collection activities depends on frequency, place of pickup, type of loading equipment and efficiency. In 10 cities of over 12,000 population with complete but separate municipal collection of garbage and refuse from business and residential areas once or twice a week, the median of man-hours per week devoted to garbage collection was 14.5 per 1,000 population, while for refuse collection it was 17.7 man-hours.

Equipment.—The type and size of collection equipment is closely related to the size of the community. Most cities of over 10,000 population utilize two or more enclosed trucks, usually of the load-compacting type, often in combination with large trucks for refuse removal. Most municipal collection cities with populations in the range of 3,000 to 10,000 operate one packer-type truck.

Costs.—Like man-hours, collection costs vary greatly. Of 33 cities providing complete and fairly frequent municipal collections, the median per capita expenditure in 1951 was $2.17 and the average $2.57. Per capita costs varied from $1.31 to $5.18. In 15 of the 33 cities, costs were from $1.95 to $2.60. Per capita collection costs do not vary with the size of the city.

Charges.—Extensive use of fees or charge is not made by Wisconsin cities. Only six cities collect fees for general collection service; several cities provide commercial collections on a fee or cost basis; and others levy charges for removal of more than stipulated amounts. With these exceptions, the cost of waste removal in cities having municipal or contract collection is a general fund expenditure. One city which levies removal charges also increases its sewerage service charge $1 on residences with home garbage grinders.

Disposal Methods

Hog-feeding.—Although the number of Wisconsin cities using the hog-feeding method of garbage disposal has declined, 26 cities—18 percent of the total—continue to use this method. Of these 26 cities, 11 have populations of over 10,000. A number of Wisconsin villages also use the hog-feeding method.

Incineration.—The number of Wisconsin cities using incineration for disposal of garbage and burnable refuse has increased from 6 to 16 (including Milwaukee) during the last 16 years. Most municipal incinerators are found in larger communities. No Wisconsin city with a population of less than 4,500 reported using an incinerator.

Sanitary landfill.—The sanitary landfill method of disposal was reported in use in 20 Wisconsin cities for garbage disposal and in 18 cities for refuse disposal. In addition, 23 communities reported the use of sanitary landfill in combination with open dump and/or open burning for garbage disposal and 31 for refuse disposal.

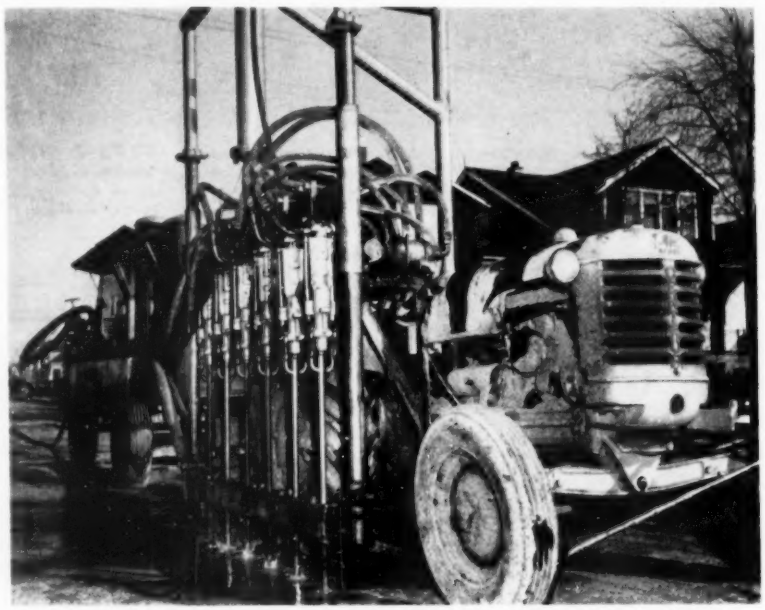
There was an apparent misunderstanding on the part of some reporting officials as to the technical definition of sanitary landfill. Several communities which only periodically cover their refuse with earth, without layer compaction and frequent coverage, reported the use of this method.

Open dump.—The traditional open dump method continues as the predominant method of disposal in Wisconsin; 59 cities reported the use of an open dump, often with open burning, for garbage disposal; 100 cities use this method of refuse disposal; some cities use the sanitary landfill method in combination with open dump and open burning.

A large proportion of Wisconsin cities have some form of control over their dumps and landfills: 112 cities have some supervision; and 83 cities fence their dumps. Of the reporting cities 42 percent restrict the hours in which dumping may be done. Complete supervision and control is found only in cities performing collections or regularly operating the disposal facilities.

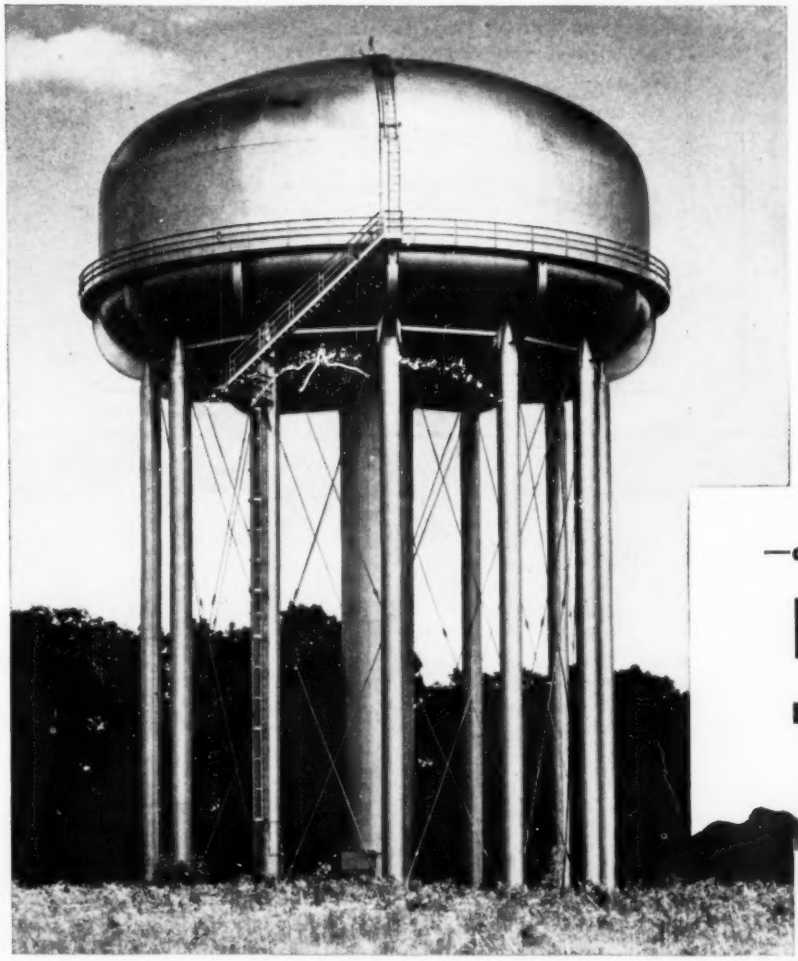
The garbage disposal facilities in 62 cities and refuse facilities in 77 cities are located within the municipal limits. Open dumps and hog-feeding farms are often outside the boundaries of the city.

Cutting Pavement for Trench Excavations



FOR cutting through concrete pavements, R. L. Coolsaet Construction Co., Dearborn, Mich., has devised a drill cutter which greatly reduces time requirements. In this machine, six drills are mounted one foot apart, on a small wheel-type tractor to which a portable air compressor is hitched. The equipment moves down the pavement as one unit. Holes are drilled six inches apart by moving the unit six inches on one move and 66 ins. on the next move. Following equipment completes breaking out of the pavement.

Time required is said to be about one-half that required by other usual methods. Only one man is required for operation. The 6-inch spacing of the holes permits easy and clean breaking of the pavement. On a 17-mile job involving a 30-inch high pressure line, the time for drilling six holes simultaneously was 1½ minutes, with an 11-inch thick pavement—8 ins. of concrete and 3 ins. of asphalt. The compressor was an Ingersoll-Rand 600 cfm rotary compressor powered by a GM 2-cycle diesel engine.



for

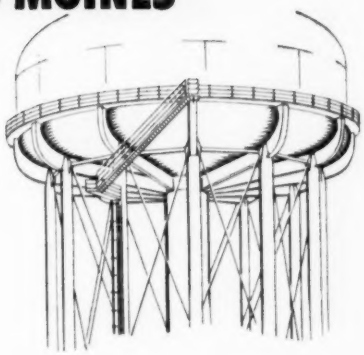
Cincinnati, Ohio

—a million gallon

RADIAL CONE

ELEVATED STEEL TANK

by PITTSBURGH • DES MOINES



The *Radial Cone* design is particularly applicable for elevated tanks of medium to large capacity where *low head range* is an important consideration. • Write for a discussion of the Pittsburgh-Des Moines elevated tank type best meeting *your* requirements.

PITTSBURGH•DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH (25) . . . . . 3442 Neville Island
NEWARK (2) . . . 236 Industrial Office Bldg.
CHICAGO (3), 1246 First National Bank Bldg.
LOS ANGELES (48), ... 6399 Wilshire Blvd.
DES MOINES (8), 943 Tuttle Street
DALLAS (1), 1247 Praetorian Bldg.
SEATTLE . . . . . 550 Lane Street
SANTA CLARA, CAL., 649 Alviso Road

Variations in the per capita reported costs of disposal were so wide as to prevent conclusions on the relative advantages of each method. Hog-feeding and the open dump appear to be the cheapest methods, the cost frequently depending on the distance of hauling required. The per capita cost of incinerator operation in larger cities compares favorably with the landfill method.

Only 20% of the reporting officials stated that it was their impression that the general public in their community regard the city's disposal methods as excellent. About half reported that the public attitude was good, and one-third thought the existing disposal methods were fair, poor or unsatisfactory.

• • •

Concrete Patching

(*Continued from page* 82)

cement, and 70°F damp curing: Strength at one day, 128 percent increase; at 3 days, 64 percent; at 7 days, 31 percent; at 28 days, 13 percent; at 3 months 9 percent; and at one year, 8 percent. These data are according to Paul Rapp as presented in the Proceedings of the Highway Research Board, National Research Council, December, 1934.

In order to minimize initial shrinkage, as stiff a mix as can be placed should be used. This will involve some hand tamping by the workmen in order to get a smooth dense surface, but shrinkage will be low. By delaying tamping until the concrete has begun to stiffen, shrinkage is further minimized. The use of concrete with a slump of about 1½ to 2 ins. is recommended. Next to backfill settlement, the use of high slump concrete would appear to be most often responsible for poor patches.

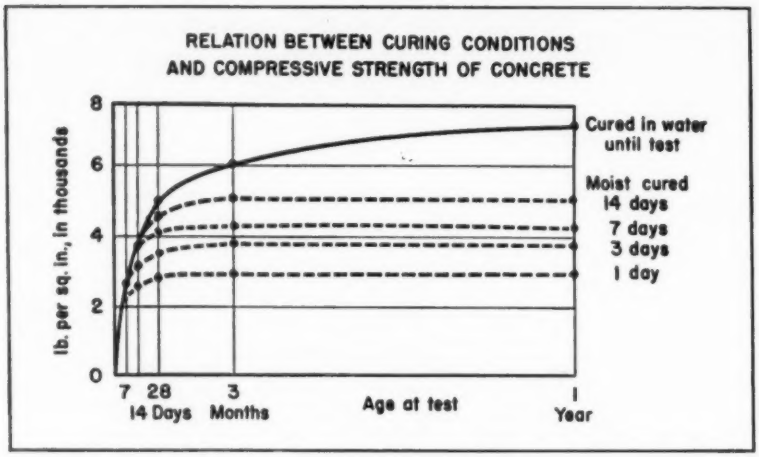
Subgrade and cut edges should be dampened before placing the mix in order to promote bond and reduce absorption of water from the mix. Painting the cut edges with cement grout is probably not justified as a general practice.

When screeding the fresh concrete, thin shims should be used on the old pavement for the screed to ride upon. This permits the new concrete to project slightly above the old surface. After being allowed to stiffen, the patch is then finished to match the surface texture as well as the elevation of the old pavement. It is particularly desirable to obtain a smooth juncture between pavement and patch both from the standpoint of rideability and to reduce the impact effect of moving loads.

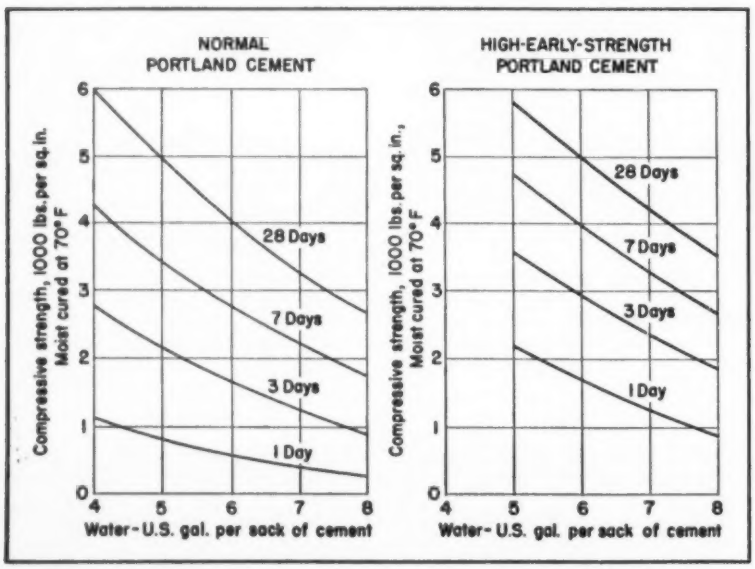
Another fundamental requirement to produce good concrete is proper curing. While there are many satisfactory curing methods, most agencies in the California area now use the membrane type. This is particularly convenient for patching work. Waterproof paper, cotton blankets, wet burlap or even damp earth may be used Where practical, some method of curing should be used for 72 hours.

Fig. 3 shows the effect of curing condition on compressive strength of cements. It will be seen that the compressive strength of specimens moist cured for 3 days and tested at age 3 months is approxmiately 30% greater than that of specimens moist cured for only one day.

Transverse joints should be installed in the patch to match joints and transverse cracks in the pavement. A tooled groove or strip type contraction joint should be placed in the top of the concrete patch, where contraction joints or cracks occur in the pavement. If expansion joints have been used in the pavement, and one or more intersect the patch, equal width expansion joints should be installed in the patch at the same point. Otherwise, when the temperature of the pavement increases above that at which the new concrete was placed, the narrow patch would be required to take most of the compression developed by the expansion of the entire pavement.



● FIG. 2—Age-strength relationships for normal and high-early strength portland cements on projects where materials, including water, are controlled.



● FIG. 3—EFFECT of curing conditions on compressive strengths of cements.

Lithographed on stone for U. S. Pipe and Foundry Co. by John A. Noble, A.N.A.

LARGE DIAMETER cast iron pipe, as illustrated, are efficiently serving as water, gas or sewer mains in large cities throughout the country. If this were a water supply line or an intercepting sewer, either bell-and-spigot or mechanical joint pipe might be used; however, for a gas feeder main these days it would most likely be mechanical joint.

Our pipe 30-inch and over, flexible joint and integral flange pipe are all made by the pit cast process. Pipe in sizes 2-inch through 24-inch are cast centrifugally in metal molds with bell-and-spigot, mechanical joint or plain ends. No matter whether pit cast or centrifugally cast, the quality of our pipe is scientifically controlled throughout its manufacture.

U.S. cast iron PIPE
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

United States Pipe and Foundry Co.,
General Offices, Burlington, N. J.
Plants and Sales Offices Throughout the U. S. A.

Now's the time to mail this month's Readers' Service card

Aero-Filter Design

(*Continued from page 59*)

block, as well as less distributor piping.

A comparative test of deep vs. shallow filters was conducted at the Chicago Sanitary District: "High-rate Filters at Chicago"[2]. Better results were produced by a single passage through an 8-ft. filter, than through two 3-ft. filters operating in series and using a 1:1 recirculation.

A. Hunter and T. Cockburn, "Operation of an Enclosed Aerated Filter at Dalmarnock Sewage Works"[3], operated a filter 52 ft. in diameter with a rock depth of 18 ft., in parallel with 4.75 acres of conventional filter 7.5 ft. deep. The 18-ft. deep filter received twice the load per cu. yd. of rock and removed 78 per cent of the applied BOD, while the conventional filter removed 64 per cent of the applied BOD. The deep filter was artificially ventilated.

Causes of Inferior Results

Excessive Loading. Where good results are required, high-rate single-stage filters, using rock or slag media, should not be loaded in excess of 1.5 pounds of BOD per cu. yd. of rock; and two-stage filters not in excess of 2.5 pounds, based on settled sewage and the total media volume. Sufficient recirculation should be used to produce a final effluent of not over 30 ppm of BOD.

Poor Distribution. Sufficient operating head should be used to insure a good nozzle discharge at all times completely to cover the filter bed. This assumes that the distributor is designed to give a good bed coverage.

Improper Recirculation. The required amount of recirculation should be employed to obtain the ppm of BOD required in the plant effluent. This is a point too often overlooked in the design.

Bad Supernatant Return. Supernatant from the digester can seriously affect a filter. The smaller the amount of supernatant return, and the better it is distributed over the 24-hr. period, the better the filter will operate. The use of a time-clock control for pumping primary sludge to the digester is recommended.

Incorrect Rock Sizing. Rock 2½ to 4 inches in diameter, with most of the material larger than 3-inch, will produce best results, assuming that most of the flats are eliminated. In order to make sure of proper sizing, rescreening at the plant site is recommended. A special tile

TABLE 3—OPERATING RESULTS AT FT. CROOK

	1943 (Oil)		1944 (Minimum of oil)			
	Jan.-Feb.	Sept.	Jan.	Feb.	March	April
MGAD to each filter	13.7	16.0	15.4	18.0	16.7	17.9
Ppm BOD to filters	278.	143.	212.	205.	180.	188.
Ppm BOD in final effluent	118.	56.	48.	53.	46.	47.
Percent BOD removal by filters and final clarifiers	57.5	60.3	77.3	74.2	74.3	75.

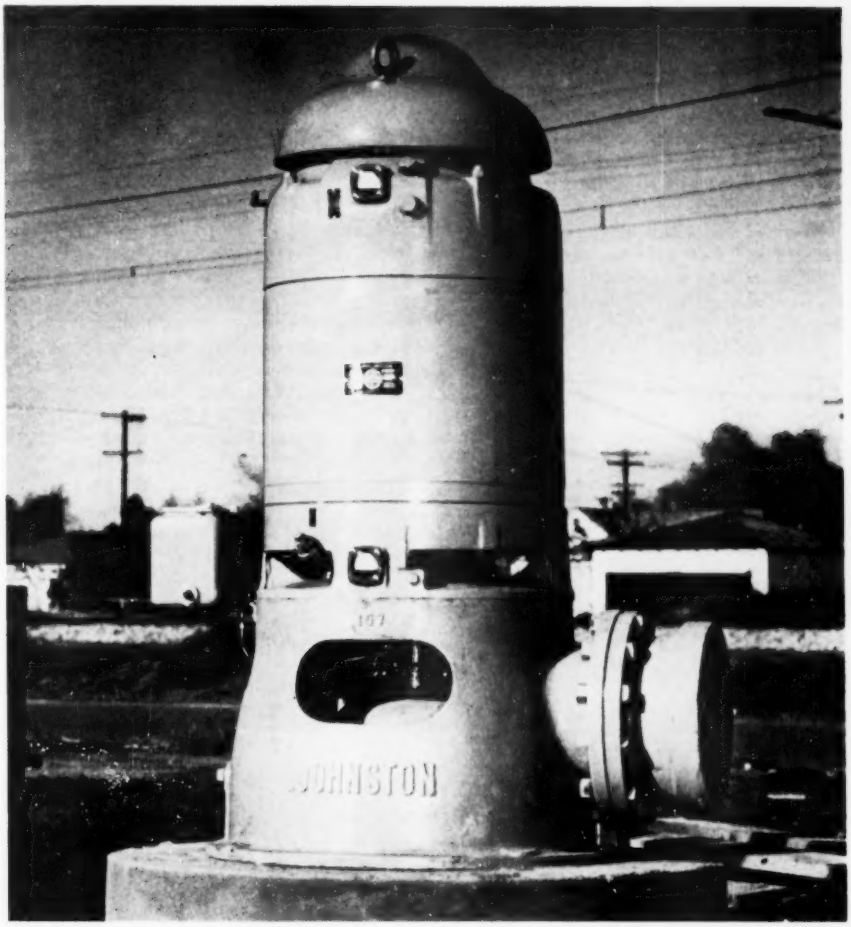
TABLE 2—RESULTS AT BRYAN, TEXAS

Ave. raw sewage flow	0.8913 mgd
Average BOD	
Raw sewage, ppm	260.
Primary clarifier effluent	113.
Intermediate clarifier effluent	28.
Final clarifier effluent	14.
Overall BOD reduction, percent	94.6
Lbs. of BOD applied to 1st-stage filter per cu. yd. of rock	0.853
Lbs. of BOD applied to 2nd-stage filter per cu. yd. of rock	0.204
Average SS	
Raw sewage, ppm	250.
Primary clarifier effluent	60.
Intermediate clarifier effluent	37.
Final clarifier effluent	17.
Overall SS removal, percent	93.2
Nitrates	
First-stage (Intermediate clarifier effluent)	12.
Second-stage (Final clarifier effluent)	18.

Greenlee Bolt Hole Treaters
assure maximum life for poles, piles, timbers
Prevent decay around holes bored in new or old poles and timbers by pressure-treating each hole bored in the field. It's a simple operation with a Greenlee Bolt Hole Treater. Treats the entire hole . . . forces preservative into all the wood cells around the bolt hole. Simply pour preservative in Treater cup until hole and cup are full. Pull back on handle, spring return does the work. Two models. Write for details. Greenlee Bros. & Co., 1742 Twenty-third Ave., Rockford, Illinois.
GREENLEE

Need more facts about advertised products? Mail your Reader's Service card now.

In small cities and large...



JOHNSTON VERTICAL TURBINE PUMPS ARE SERVING MUNICIPAL WATER SYSTEMS

The City of Lynwood, like many California communities, has been faced with expanding water requirements in recent years due to a fast-growing population.

Located over a good groundwater reservoir, Lynwood naturally depends on deep wells for a majority of its water supply. Many pumps, like the Johnston pictured here, deliver the supply directly into the city mains, a job that is *really tough* on pumps. Not only must the pump operate with month-after-month dependability...at high sustained efficiency with low operating cost; but also must withstand constantly fluctuating heads without overloading the motor.

The Johnston Pump selected by Lynwood engineers, is a 125 horsepower unit, delivering 1500 gallons per minute from a depth of 140 feet, against a 250 foot total head. Worth noting is the fact that an independent organization employed by the City rated the pump at 74% overall efficiency in the acceptance tests . . . a bonus of 4 points over Johnston's guaranteed rating of 70%.

This is another typical example of the ability of Johnston equipment to handle tough pumping jobs. Why not let our trained engineering staff consult with you on the best solution to YOUR particular problem?

Send today for your free copy of our bulletin, WATER—WHERE YOU WANT IT . . . WHEN YOU WANT IT. Ask for Bulletin J-23.

JOHNSTON VERTICAL PUMPS

JOHNSTON PUMP COMPANY

3272 E. FOOTHILL BLVD. PASADENA 8, CALIFORNIA

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

media which is being used in a number of filters, eliminates rock difficulties. The tile are stacked so that the 1-inch diameter holes line up through the entire filter depth. It is quite essential to use a spray application with tile media. The tile can be obtained from several sources.

Mineral Oil. Our mechanical age results in more or less mineral oil finding its way into the sewage. The better the removal of this oil before it hits the filter, the better the chance the filter will have of doing a good job.

At Ft. Crook, Omaha, Nebraska,[4] in Jan. and Feb., 1943, the poor results produced by the filters might have been laid to the cold weather by one who did not know that a large amount of mineral oil was reaching the filters because bombers were being assembled there at that time. The mineral oil condition was very bad during 1943, but was greatly improved, although not entirely eliminated, in 1944. At that plant, there are two 30-ft. diameter Aerofilters, each 8 ft. deep, using motorized disc distributors. Significant data are shown in Table 3.

High-rate or high-capacity filters are becoming more popular each year, as more and more people are coming to realize that they will do a fine job provided they are properly designed and operated. Their great saving in initial cost, over the old style conventional filter, more than offsets their slightly greater operating cost because of the recirculation requirement. For that matter, conventional filters would handle more BOD if they were continually, instead of intermittently, operated. Contrary to the opinion of some engineers, filters will function at 3, 7, 10, 15, 20 or most any other mgad rate that may be desirable, but for one passage through the filter it is well to hold the average below 20 mgad.

Naturally the greater the loading on the filter, the less will be its tendency to produce a nitrified effluent. However, with deep filters, nitrates can be produced provided the loading is not in excess of 1.5 lbs. of BOD per cu. yd. of rock, and provided the final effluent is held below 30 ppm of BOD.

Cold weather will not as adversely affect the performance of high-rate filters as it will the large conventional filters, because continuous flow to the high-rate filter keeps the media warmer than when the flow is shut down, sometimes for an hour or more during the night, on conventional filters. In making any comparison of the effect of temperature on the two types of filters, one should take into account the number of conventional filters that have to be closed down during the winter months.

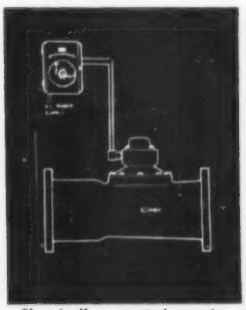
Bibliography

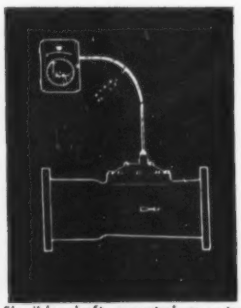
(1) J. A. Montgomery, "Aero-filter Results", Sewage Works Engineering, November 1942
(2) T. W. Herrick, Sewage Works Journal, March 1938
(3) A. Hunter and T. Cockburn, Abstract in Sewage Works Journal, page 648, May 1945
(4) J. A. Montgomery, "High-capacity" Trickling Filters", Water and Sewage Works, page 122, March 1946.

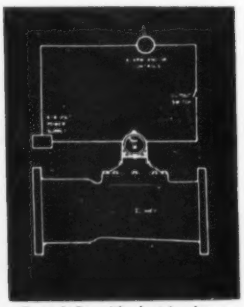
• • •

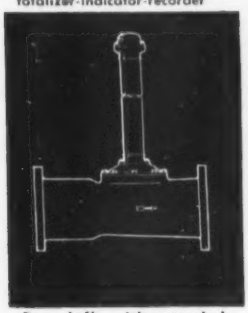
Spotting Speeders With Radar

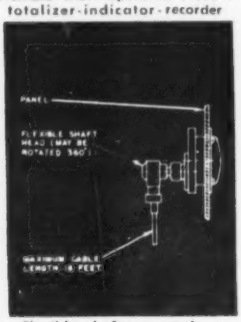
An "electromatic speed meter" modeled after wartime radar is being used to control speeders on Connecticut highways. Microwave signals sent out by the device are reflected off moving vehicles, automatically recording the speed of the car. Violators are picked up by waiting patrol cars on radioed directions from the radar operator.


Electrically operated remote totalizer-indicator-recorder


Flexible-shaft-operated remote totalizer-indicator-recorder


Propeloflo with electric alarm totalizer


Propeloflo with extended totalizer



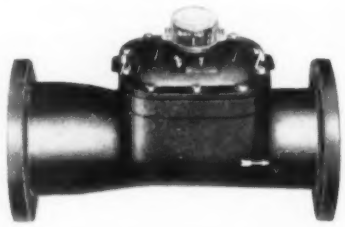
Flexible-shaft-operated remote totalizer

Electrically operated remote totalizer

Six Ways to Save Water !

Install Builders Propeloflo Meters and start "plugging" water wastes today! One of the most versatile meters on the market, Propeloflo can be equipped with auxiliary attachments for transmitting flow facts to conveniently located control panels or with an electric alarm register for operating remote alarms or for actuating remote controls.

Builders Propeloflo Meters are available for lines 2" to 36" in diameter and larger—in four types: flanged, bell and spigot, threaded, or "saddle". Send today for Bulletin 380-G2A. Builders-Providence, Inc. (Division of B-I-F Industries), 356 Harris Ave., Providence 1, Rhode Island.



B-I-F INDUSTRIES — A CENTURY OF QUALITY 1853 — BUILDERS

Get full details of this month's new products . . . mail your Readers' Service card today.

GET THE FACTS about the WHITE 3000 AND SAVE

MUNICIPAL *service work goes faster by White 3000. Garbage and refuse collection units like this one permit longer routes, improved service because of outstanding maneuverability and driving ease. Substantial maintenance savings, too, with the exclusive power-lift cab.*

FIND OUT what the White 3000 does in *your* service . . . on *your* city streets. See what its modern design means to you in the way of improved service, longer routes, new efficiency and economy in all kinds of service operations.

Here is new maneuvering ease in the tightest of places . . . new time and energy savings . . . new safety features . . . shorter wheelbase . . . extra carrying ability.

Its exclusive power-lift cab saves substantially on maintenance time and cost. And its White Quality means lower operating cost . . . fuel economy . . . year after year!

Get this Scientific Truck Evaluation from your White Representative . . . Today!

Call your White Representative for a complete evaluation of *your* truck operations. It will tell you the factual story of efficiency and economy tailor-made to your own delivery service. It means money saved . . . delivery costs reduced . . . in your business!

THE WHITE MOTOR COMPANY
Cleveland 1, Ohio

White

FOR MORE THAN 50 YEARS
THE GREATEST NAME IN TRUCKS

Thousands use our Readers' Service card to keep up to date . . . do you?

Equipment Cleaning

(*Continued from page 72*)

tions: Clean with heavy-duty steam cleaners if you have: (a) many track-layers; (b) lots of heavy cleaning, that is, tars, thick mud or greasy dirt; (c) work requiring one man all day long.

Clean with steam vapor models where: (a) you clean only intermittently and then for only 2 or 3 hours; (b) you have only 2 or 3 hours of cleaning every day; (c) you want a spare cleaner that's easily taken into the field for steam cleaning on emergency repair jobs.

Steam vapor cleaners cost less than the heavy-duty, high pressure models, but, because they require steam for pressure (limited to 75-100 psi) they have to be burning all the time cleaning is in progress. There are constant fuel costs and the machines are limited in cleaning actions to hot solution and vapor.

Heavy-duty steam cleaners, because they get pressure by means of a pump, are most versatile, can deliver cold water up to 400 psi; hot solution up to 325 deg F coil temperature; hot water up to 325 psi and 115-160 deg F; warm water at low pressure; and wet steam at low pressure. On many models two or more guns can be used simultaneously, one delivering high-pressure cold water, the other high-pressure hot solution. These heavy-duty cleaners have capacities ranging from 300 to 2,100 gph.

Cleaning construction equipment is much like washing grimy hands; the dirtier they are the more pressure, soap and water needed. Because heavy-duty models provide higher pressures and greater water or solution volume, they are used more generally for the tough cleaning needed on tractors, shovels, compressors and trucks.

While each operater has his own favorite methods, here's a list of generally recommended practices for heavy-duty cleaning:

FOR QUICKLY REMOVING stubborn deposits of grease, road oils and tar: High-pressure steam cleaning, 150 to 200-lb. pressure and up to 325° F coil temperature.

FOR REMOVING common dirt, mud and clay: High-pressure cold water to 400 lbs. at 5 to 15 gpm.

WHERE MUD AND DIRT are impregnated with oil and grease or where there are light deposits of grease and oil; also for quick deicing: High-pressure hot water to 400 lbs. at 5 to 10 gpm.

FOR HAND-WASHING trucks and equipment: Low pressure warm water, 3 to 15 gpm at 120 to 200°F.

FOR DEGASSING TANKS; heating asphalt tanks; cleaning asphalt tanks; and for sterilizing purposes: Straight steam, 15 to 30 lbs.

Some users presoak dirt and grease with a diesel oil emulsion spray. This saves both chemical and time, because the dirt can then be removed by high-pressure hot water alone.

To strip paint down to metal, most operators first spray or wash the painted surface with a paint stripper.

• • •

Industrial Wastes

(*Continued from page 70*)

companies encourage their employees to take part in all community affairs, and enter into the community government, boy and girl organizations, YMCA, etc. They usually do this from the American spirit of cooperation in all worthy affairs; in few cases is it done to

ENDURING PROTECTION

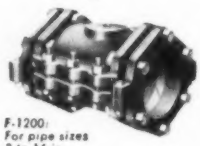
as traffic rumbles on!

Reinforce all hard-to-get-at pipe joints with

CLOW MECHANICAL JOINT BELL SPLIT SLEEVES

F-1205: For pipe sizes 3 to 16 in.

Under the constant impact of ponderous, ever-increasing rail and vehicular traffic on our highways and railways, crossing underground water pipe lines require added protection. That is why foresight is so important. *Play it safe*—don't wait for a break. Install Clow Mechanical Joint Bell Split Sleeves as *original equipment* wherever pipe must pass under highway truck routes and railroad tracks. Specify them for marshlands and under water—everywhere pipe is not readily accessible in case of an emergency. Clow Mechanical Joint Split Sleeves are easy to install—no lead, jute, or calking.



F-1200: For pipe sizes 3 to 16 in.

F-1200 Clow Mechanical Joint Straight Split Sleeves are ideal for permanent repairs to pipe barrels. 12-in. and smaller sizes will repair any lengthwise break up to 8 in.; 14- and 16-in. sizes, to 17 in.

Write for illustrated circular containing full particulars and other pertinent information.

JAMES B. CLOW & SONS
201-299 North Talman Avenue • Chicago 80, Illinois

and their National Cast Iron Pipe Division, Birmingham, Alabama
Subsidiaries: Eddy Valve Company, Waterford, N.Y.; Iowa Valve Company, Oskaloosa, Iowa

Now's the time to mail this month's Readers' Service card.

gain favor or advantage from the community.

However, the fact that industries *do* take their place in the local civic life entitles them per se to some special consideration when the question arises of charging them for the handling of their liquid wastes. This may take the form of a lower charge for all local industries which pay substantial taxes or contribute heavily to local affairs, or it may be affected in the same way by a definite deduction of all or a part of their tax payments from the annual bill for waste services.

It will be said, perhaps, that, in the case of a large industry with heavy property investment and with a large tax bill, the taxes paid will be considerably more than any charge which might be made for waste treatment or handling. This could be true, and it is manifestly unfair to others to remit the entire tax payments to cover waste charges. In these cases, the amount of taxes paid should be weighed against the total tax collected in the community and the ratio between the tax of the industry and the total tax calculated. This ratio can then be applied to the waste treatment bill. Thus, if the ratio of industry tax to total tax is one-tenth, then the industry should receive a reduction of at least one-tenth of its taxes against its waste bill.

This would apply in those cases where the industry discharges its waste into the public system. A satisfactory formula based on this abatement of taxes has been devised by Harold F. Gray of California and is included in Table 1.

Where the industry does not in any way burden the municipality or its public systems with its wastes but takes care of them on its own property by building and operating works at its own expense, there is no good reason why the industry should not receive abatement of taxes up to 100 per cent of the annual costs of operation of their waste plant. This type of recognition of rights of industry will go far toward encouraging more and more industries to cooperate gladly and willingly with the community in the solution of their problems.

Relationship between the local officials and industry's management, will be put on a much higher plane, if, as stressed throughout this series, the local officials will consider industry merely on the same basis as they would any one of their citizens, and will show a willingness to meet halfway down the line.

for CLEAN STREETS

You know this is true: **only hand-pushed brooms get all the dirt.**

For dependable, economical **SERVICE** Tarco "Street Sweepers' Friend" Carriers are **BEST.**

Choice of STYLES: for a **single can** or for **two cans.**

Choice of large wheel TIRING: **pneumatic, solid rubber** or **plain steel.**

Balanced and free-running. Silent can clamp. Safety traffic-warning flag. Full swiveling castor wheels. Level lift sweeper scoop (optional).

Your sweeper cart for years to come: a TARCO

Other TARCO Products

"Scotchman" Spreader **"Flash-Flame" Dryer**

"Direct from the Shipping Drum" Sprayer

Asphalt Pouring Pots **Street Refuse Cans**

TARRANT Manufacturing Company
27 Jumel St., Saratoga Springs, N. Y.

Which butterfly valve better meets your needs?

In either of these or any other valves, manual or automatic, which W. S. Rockwell builds for your exact needs, you're sure to get the right type and size to best meet the conditions of operating pressure, temperature and nature of fluid handled, whether it be air, gases, water, liquid or semi-solid chemical materials.

It will pay you to learn how Rockwell Valves can meet your plant's flow control requirements.

Rockwell stainless steel valve; with air cylinder operator and valve positioner; for throttling gases at 1200° F.

Rockwell heavy duty valve for 50 p.s.i. working pressure; has a replaceable rubber liner for valve body and stainless steel blade; with a motor operator and handwheel declutching unit.

Write for Valve Catalog

W. S. ROCKWELL COMPANY

BUTTERFLY VALVES • SLIDE VALVES • AUTOMATIC VALVES

2523 ELIOT STREET • FAIRFIELD, CONN.

Need more facts about advertised products? Mail your Reader's Service card now.

PUBLIC WORKS DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

SEWERAGE AND REFUSE . . 100
HIGHWAYS AND AIRPORTS . . 107
WATER WORKS . . 114

THE SEWERAGE AND REFUSE DIGEST

Storage in Storm Sewers

During the past few months, English engineering papers have contained numerous letters from engineers defending the idea that in designing storm sewers considerable allowance should be made for the large amount of run-off from peak rainfall that can be stored in the sewer itself. Some of these letters contained more or less complicated formulas for calculating the amount of storage available. Discussing these in a recent article, E. Dixon Grubb said "In some fields of scientific research, it is possible to make accurate predictions by means of the logical development of basic principles. . . . On the other hand, it is doubtful whether a similar approach is suitable for a subject such as sewer design, which depends upon a large number of complex factors, many of which are difficult to isolate for individual analysis. Sewer design may never become an exact science. The more elaborate the calculations, the easier it becomes to overlook the basic dependence upon assumptions. A slight change of development policy may make more difference to the result than a change in the method of runoff calculation. . . . The ultimate choice of a suitable sewer capacity depends at least as much upon judgment as upon calculation. However, he says, "further investigation is likely to show that it is safe to add some figure to the orthodox time of concentration," especially in sewers with flat gradients.

E. Dixon Gruble—"Some Practical Aspects of Storage and Stormwater Sewer Design;" *The Surveyor*, Dec. 20.

Insects in Sanitary Fills

The only insects that have given any cause for alarm on sanitary fills (in England), are the blue bottle fly, the lesser house fly, the common house fly, and the common cricket. The blue bottle lays its eggs usually in some crevice in a piece of meat. The house flies deposit their eggs on vegetable matter, manure, and remains of food in cans and jars. Household refuse as collected may be very heavily infected with fly eggs, larvae and pupae. Good operating methods, paying particular attention to consolidation of the refuse, can do much to minimize the emergence of the flies from the fill. But an additional precaution should be taken of spraying the refuse, after being dumped, with DDT or Grammexane.

Crickets thrive in warm places, and find abundant food in the fill. They congregate in large numbers in empty food cans, and under loose boards, pieces of carpet etc. and such materials should be buried or removed. Regular spraying with insecticides will help control crickets as well as flies.

G. Moore—"A Chemist's View on Controlled Tipping;" *Municipal Engineering*, Dec. 19.

Surface Tension Of Sewage

Surface tension has been under investigation at the Indianapolis Sanitary District laboratory as one of the important physiochemical aspects of sewage. The normal range of surface tension of Indianapolis sewage was found to be between the narrow confines of 38.9 to 71.6 dynes per centimeter. There is evident an inverse relationship of surface tension and solids, subject to the relative surface active properties of the solids. To a fairly consistent degree, a greater concentration of dissolved oxygen is observed at higher surface tension levels. Further increased usage of synthetic detergents will continue to cause a slight reduction of surface tension of the sewage, but probably not much.

D. R. Bowers—"Measurement of Surface Tension of Sewage;" *Sewage and Industrial Wastes*, December.

Treatment of Rendering Plant Waste

Wastes from rendering plants are greasy, black, septic and smelly. Most of the organic matter is partially decomposed and therefore in the colloidal or dissolved form. Even though there are essentially no carbonaceous-type compounds present, standard methods of treatment are applicable. Inasmuch as the raw material is in a state of partial decomposition, the efficiencies found in treatment of packing house wastes are not necessarily to be found with this type of waste.

Marvin L. Granstrom—"Rendering Plant Waste Treatment Studies;" *Sewage and Industrial Wastes*, December.

Reduction of Milk Waste

Incomplete recovery of milk from freshly dumped milk cans in dairy plants is common. By providing for

a slight pause over the weigh tank, milk losses can be reduced substantially. Nearly 50% of the drainable milk remaining in properly handled cans may be recovered at the load position, while more than 95% can be recovered by providing 21.5 sec. additional drainage. The recovered milk should be fully utilized, otherwise it is still a part of the waste problem.

V. Schwarzkopf—"Reduction of Milk Waste in Dairy Plants;" *Sewage and Industrial Wastes*, December.

An English Grit Separation Tank

An English engineer, C. D. C. Braine, described in a paper before the Institute of Sewage Purification a grit separation tank which had been used as a substitute for grit channels and grit washing devices. This is a tank resembling a small Dortmund tank through which the sewage passes by downward, followed by upward flow, the heavy suspended matter settling into the bottom hopper. A small quantity of returned effluent is pumped into the bottom of the hopper and keeps the accumulated grit in a state of gentle flotation and cleans it; and in rising, it deflects the entering sewage and prevents its mixing with the grit. The grit can be removed by means of an air lift, or a gravel pump, or a screw conveyor.

"Some Economic Aspects of Sewage Works Design;" *Contractors Record*, September.

Composting Of Night Soil

Nantich Rural District has developed a system for composting about 54 loads of night soil per week, each load containing 300 gal. This is collected from 3,075 pails. Two lagoons are operated, each about 6 ft. wide by 2 to 3½ deep by about 50 ft. long. One is thickly bedded down with straw and the loads of night soil dumped on it as they arrive and at once covered with a thick layer of straw. It is filled in five or six weeks, when the second is put into use. When the second has been filled, the material is drawn out of the first and stacked and covered with straw. The stack is turned over after it has stood for about a month. After standing for at least another month it is ready for use as fertilizer. Lagoons, stacks, sumps and drainage channels should at all times be kept well covered with straw. A ton of straw is sufficient for 75 300-gal. loads of night soil. Paper may be substituted for 50% of the straw. This fertilizer is sold for 50 shillings a load delivered, or 20 shillings at the lagoon.

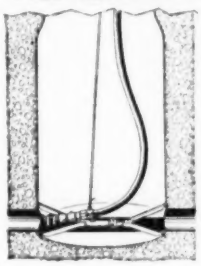
John S. Townley—"Disposal of Night Soil by Composting;" *The Surveyor*, Jan. 3.

Why New York Adopts Incineration

New York City treated its garbage by reduction early in this century, but abandoned it in 1918 as uneconomical. Manual-type incinerators followed but were abandoned in the 1930's in favor of the cheaper land fill method. Meantime some or all of the refuse had been dumped at sea, but in 1934 this was stopped by the U. S. Supreme Court because floating refuse fouled the New Jersey beaches. Crude land fill methods created nuisances, and sanitary fill, with improved sanitary control and operational methods, was developed by public health experts until it is now considered to be nuisance-proof. By this method over 1,500 acres of non-usable marginal land have been reclaimed, and an additional 3,000

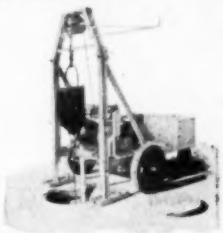
"FLEXIBLE" *Exclusives* THAT *Revolutionized* SEWER CLEANING

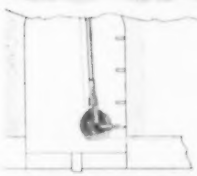
Since 1932 FLEXIBLE has led in pioneering improved sewer cleaning methods and equipment. Here are today's most important "FLEXIBLE" musts!



The **SeweRodeR**

A mechanical marvel that does all rodding with one man and a helper. Pushes, turns, pulls . . . pulls back loads and "rods in" for more.





***Surface-Hung* MANHOLE ROLLER**

Works loose brick manholes (any size) far faster. Fits any two leg bucket machine. Installs from above ground.

FLEXICROME ROD COUPLING

An improved coupling recommended for HIGH-SPEED POWER TURNING . . . developed through years of experience. Never connects in the wrong hole. Faster to assemble.

"FLEXIBLE"

WRITE today

SEWER-ROD EQUIPMENT CO.

9059 VENICE BOULEVARD, LOS ANGELES 34, CALIF.

41 Greenway St. — Hamden 14, Conn.
147 Hillside Terrace — Irvington, N. J.
P. O. Box 465 — Memphis, Tennessee
1115 Delaware Ave. — Fort Pierce, Fla.
141 W. Jackson Blvd. — Chicago, Ill.
200 Magee Bldg. — Pittsburgh, Penn.
66 Kiniry Drive — Rochester 9, New York
29 Cerdan Avenue — Roslindale 31, Mass.
801 E. Excelsior Blvd. — Hopkins, Minn.
3786 Durango St. — Los Angeles 34, Calif.
4455 S.E. 24th Street — Portland, Oregon
351 West Jefferson Blvd. — Dallas, Texas
Francis Hankin — Montreal & Toronto, Canada

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS AND EQUIPMENT

Get full details of this month's new products . . . mail your Readers' Service card today.

acres have been earmarked for similar reclamation.

But in 1950 6,533,100 tons of refuse were collected, and the disposal of this amount yearly by land fill would use up all of the available areas in comparatively few years, and intelligent foresight necessitated the development of a sound program to conserve these sites. Hog feeding now handles only about 4% of the refuse, and presents inherent major sanitary and health problems. Garbage grinding and handling in sewage treatment plants would entail some costly reconstruction of existing sewer systems and additions to sewage treatment plants. Composting is still inadequately developed for serious consideration by a city as large as New York. Moreover, these methods are limited to putrefiable food wastes, which amount to less than 20% of all the refuse. Incineration disposes of all the refuse, obviates the need for dual collection and disposal, and, by placing incinerators in near central locations (16 have been selected, distributed throughout the city, 5 on Manhattan island), there would be a substantial saving in haulage costs, which costs now average 30 cents per round-trip ton-mile. Incinerator ashes would total only about 12% by volume of the original refuse, and would be acceptable for fill anywhere. It is calculated that incineration would reduce the volume to be disposed of by 14,000,000 cu. yd. annually—a much needed saving to conserve the rapidly dwindling tidal lands available for fills.

Sites selected for incinerators were placed as close as possible to the center of gravity of the refuse produced within the area to be serviced. This was modified where necessary by such considerations as probable public acceptance; zoning regulations; type of probable future development of the neighborhood; availability of inexpensive land of adequate extent to accommodate in most instances the combined incinerator, garbage and marine transfer station. (13 of the sites selected are on navigable waters); height restrictions imposed by the Civil Aeronautics Administration; and foundations conditions.

C. A. Rogus—"New York City Turns to Incineration;" *Civil Engineering*, December.

Objectives in Operating Activated Sludge Plants

The most important objective in plant operation is the maintenance of proper procedures once they have been determined. By immediate correction of any abnormal conditions, serious troubles can be avoided. Good records representing actual conditions are the primary sources of information indicating trouble. Operational procedures should be reviewed to determine the following points: Are samples representative of actual flow conditions? Are they taken at a time which will be of most value? Are they composited according to flow? Is sludge withdrawal from the primary tank proper? Is waste sludge rate controlled adequately? Are aeration tanks operated properly? Is the air supply varied in accordance with the load? Is the mixed liquor concentration proper for the type of plant and load? Is the D.O. level adequate? Are the digesters operated properly? Is the supernatant returned slowly or all in one slug?

If all the above points are found to be correct when compared to normal operating figures, no difficulty will be encountered. When, however, one or more vary from

Leading THE
PUMP
PARADE
. . . in many
of the World's
Important Places
For nearly 40 years buyers have believed in the soundness and progressiveness of Wheeler Economy Pump engineering. The reason is longer life. Case records show Wheeler-Economy Pumps operating 15 to 20 years without replacement of major parts. Here is just a random selection of installations to prove Buyer Belief in Wheeler-Economy Pumps . . .
They are installed in the White House as part of the new air conditioning system . . . An installation of large Wheeler-Economy Pumps is playing a part in one of the most isolated and vital spots in the South Pacific. Three Wheeler-Economy Pumps are installed in a jet engine laboratory pumping river water to cool generating engines . . . Wheeler-Economy Circulating Pumps furnish air-conditioning in the world's tallest building . . . There are Wheeler-Economy Pumps on many major ships . . . and huge Wheeler-Economy Circulators in major central power generating stations . . . Near Wapato, Washington, Wheeler-Economy Pumps irrigate thousands of acres of agricultural land under the Grand Coulee Dam project . . .
And this is only a small part of the record. There are Wheeler-Economy Pumps for every pumping need from small units for equipment manufacturers to giants of 200,000 GPM.
There's a distributor or district office as near as your phone. Look him up.
E-137-R
WHEELER-ECONOMY PUMPS
ECONOMY PUMPS, INC. • DIVISION OF C. H. WHEELER MANUFACTURING CO.
19TH AND LEHIGH PHILADELPHIA 32, PA.
Thousands use our Readers' Service card to keep up to date . . . do you?

the normal, corrective measures should be started immediately.

John T. Tapleshay—"Operation Objectives in the Activated Sludge Process;" *Sewage and Industrial Wastes*, December.

Garbage Grinding and Sewage Disposal

At Jasper, Ind., the first community to attempt city-wide installation of household garbage grinders, a study was made to determine the effect on various utilities. Water consumption increase was very slight. The sewer system did not appear to be affected; in fact there were fewer sludge deposits after grinding than before. Sewage showed an increase in BOD and in grit. The treatment plant design provided for an increase in capacity of 50 percent for the aeration tanks and 60 percent for the sludge handling units. Efficiency of sedimentation units seemed unusually high; and BOD reductions through the plant were good. There appeared to be reductions in both fly and rodent populations on the basis of comparisons with neighboring communities having the same general characteristics.

"Community Effects of Household Garbage Grinding"; PUBLIC WORKS, January.

Sewage Treatment And Sewage Research

The sewage treatment plant for the new Link-Belt factory at Lansdale, Pa., is designed not only to treat the sewage from the plant, but also to provide opportunity for research in industrial waste treatment. There is a specially designed primary settling tank, two high rate filters, a special secondary tank and an unheated digester, plus some special features for recirculation and flood period operation. Design flow is 90 gpm based on contributions of 92 gals. per person per day from a total of 1400 employees. Extra sludge digestion capacity is provided for night shift employees.

"Dual Purpose Sewage Treatment Plant Provides Research Facilities"; PUBLIC WORKS, January.

Garbage and Refuse in Ohio

Studies of garbage collection and disposal in Ohio, covering 121 cities, showed that in only 26 percent of 103 cities was storage on the premises "good," while in 18 percent it was "fair." Half of the cities have municipal collection of garbage and 44 percent similarly collect refuse. Payments for garbage collection are from general funds in 49 cities and from a service charge in 65. All premises are served by garbage collection in 53 cities, and 80 percent or more of the premises in 10 other cities. Collection costs ranged from $5.63 to $9.12 per ton and overall costs of collection and disposal from $2.18 to $2.82 per capita.

"Garbage and Refuse Collection and Disposal in Ohio"; PUBLIC WORKS, January.

BIBLIOGRAPHY

Civil Engineering

New York City Turns to Incineration. By *C. A. Rogus*, Dir. of Eng., Dept. of San. December, Pp. 54-59, 102.

Weir Plates Helpful in Sewer Gaging. By *Arthur W. Sweeton*, Chief Des. Engr., Hartford Bureau of Public Works. January, P. 64.

Contractors Record and Public Works Engineer (England)

Some Economic Aspects of Sewage Works Design. By *C. D. C. Braine*. September, Pp. 21-25.

Engineering News-Record

Acid Waste Problem Put Into Perspective. Dec. 25, P. 38.

Now's the time to mail this month's Readers' Service card.

Municipal Engineering (England)

A Chemist's View on Controlled Tipping. By *G. Moore*, Chemist to Manchester Cleansing Dept. Dec. 12, Pp. 354-356. Dec. 19, Pp. 378, 380.

Chemical Oxidation—Some Laboratory Experiments in the Treatment of Chemical Trade Wastes. By G. Taylor, Dec. 26, Pp. 408-410. Jan. 2, Pp. 418, 420.

Sewage and Industrial Wastes

Measurement of Surface Tension of Sewage. By *D. R. Bowers*, Chf. Chemist, San. Dist. of Indianapolis. December, Pp. 1447-1455.

The Determination of Surface Active Agents. By *George R. Lewis* and *L. Kermit Herndon*, Prof. Chem. Eng., Ohio State Univ. December, Pp. 1456-1466.

Control of Sewage Chlorination by Amerometric Titration. By *W. L. Henderson*, Chem., Joint Outfall Sewer, Santa Ana, Calif. December, Pp. 1467-1472.

Removal of Carbon Dioxide from Digester Gas. By *James E. Frook*, Chem. Bacteriologist, Div. of Sew. Disp., Toledo, O. December, Pp. 1473-1477.

Rendering Plant Waste Treatment Studies; Pilot Plant Investigations. By *Martin L. Granstrom*, Asst. Prof. San. Eng., Univ. of N. C. December, Pp. 1478-1488.

Reduction of Milk Waste in Dairy Plants. By *V. Schwarzkopf*, V. P., Lathrop-Paulson Co. December, Pp. 1489-1494.

A Rational Approach to Industrial Waste Disposal Problems. By *R. N. Giles*, Dir. of Tech. Service, Standard Oil Co. December, Pp. 1495-1501.

Color in Industrial Wastes. By *Willem Rudolfs* and *William D. Hanlon*, Rutgers Univ. December, Pp. 1502-1508.

White Water Treatment: Mesophilic and Thermophilic Digestion. By *Willem Rudolfs* and *Herman K. Amberg*, Rutgers Univ. December, Pp. 1509-1511.

The Oxygen Resources of San Diego Bay. By *Isadore Nusbaum* and *Harold E. Miller*, Calif. Water Pollution Control Bd. December, Pp. 1512-1527.

Operation Objectives in the Activated Sludge Process. By *John T. Tapleshaw*, Chicago Pump Co. December, Pp. 1529-1532.

Activated Sludge Plant Operation. By *T. R. Haseltine*, Cons. Engr. December, Pp. 1533-1536.

Interesting Extracts from Operation Reports. December, Pp. 1538-1540.

Cyanide Waste Disposal Survey. By *Paul R. Carlson*, Chem., San. Dist. of Rockford, Ill. December, Pp. 1541-1543.

The Surveyor (England)

Some Practical Aspects of Storage and Storm-water Sewer Design. By *E. Dixon Grubb*. Dec. 20, Pp. 811-813.

Disposal of Nightsoil by Composting. By *John S. Townley*, Chf. San. Inspector, Nantwich Rural Dist. Jan. 3, Pp. 15-16.

Technique de l'Eau (Belgium)

L'Epandage Agricole des Eaux Residuaires des Villes et de Certaines Industries. By *M. F. Sigmund*.

Water and Sewage Works

Equitable Utilization of Stream Resources by Industries. By *Earle B. Phelps*, Prof. of San. Sci., Univ. of Florida. December, Pp. 495-497.

Western City

Refuse Collection and Disposal Practice in California. By *Erman A. Pearson*, Asst. Prof., and *Harold B. Gotaas*, Prof. of San. Eng., Univ. of Calif. December, Pp. 43-47.

• • •

Red Side Stripes in Highway

A concrete road in Holland, opened in April, 1952, is 21 cm. thick and 7.25 m wide, divided into two lanes, by a longitudinal joint. The usual construction there is a concrete surface 6.25 m wide with a 0.5 m brick-paved shoulder on each side. In this road, however, the entire 7.25 m width is concrete, and a strip 0.4 cm wide on each side is painted red to indicate the edge of the pavement.

Cleaning a Water Works Reservoir

CLEANING a distribution reservoir in a city water works system requires a lot of planning. Such a job, done by an unnamed city, was described by an unnamed writer in a recent issue of the "Clarifier" of the South Dakota Department of Health's Sanitary Engineering Division. The operation was scheduled to take place between 10 PM and 6 AM, because this is the period of minimum water consumption. A mobile public-address system was used to notify residents to conserve water for a 24-hour period beginning at 8 PM.

The cleaning operation had been well organized by City Officials. An auxiliary pump was on hand to drain completely the reservoir; two metal bushel baskets, with rope and pulley hoisting arrangements, were ready for hauling out sand; one of the City fire trucks was to be utilized for washing down reservoir walls; and by 10:00 P.M. all the necessary tools and workers were standing by.

There was considerable apprehension in everyone's mind, as the water level receded. Fifteen years had gone by since this reservoir was last cleaned. Such apprehension was justified before the night ended.

The fire-truck pump made short work of the water remaining in the reservoir. As soon as the water level was sufficiently low, the writer entered the reservoir. The entire bottom was covered with sand and mud, about six inches deep in the center and three feet deep in the corners and on the side of the well discharge. This sludge was very black, probably due to the reduction of sulphates, and possessed a strong musty odor, which no doubt had imparted considerable taste to the water supply. There was also an assorted accumulation of water-logged boards, paper, and other foreign matter.

Removal of the sludge was started, workers shoveling the deposit into the metal baskets which were hoisted to the surface, dumped, and returned. The walls were scrubbed, using heavy street brooms. An estimated 30 cubic yards of sludge were removed by 3:00 A.M., which meant that the water storage capacity had been reduced by

How to Test for Sea Water Contamination in Drinking Water

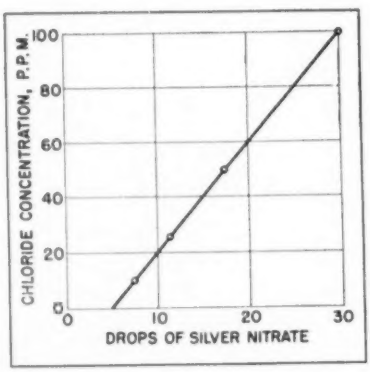
A semi-quantitative method for determining possible cross-connections between sea water and drinking water lines is described by Alfredo Salazar of the Boston Naval Shipyard in the Navy Medical News Letter.

Reagents: (1) A 1 per cent potassium chromate solution. Dissolve one gram in 100 cc of distilled water and store in a clear glass bottle. (2) Silver nitrate solution N/100. Dissolve 0.85 gram of the solid silver nitrate in 500 cc of distilled water and store in a brown bottle.

Equipment: There are needed several 8-oz. glass collecting bottles; two eye-droppers, one for the chromate solution and one for the nitrate solution; one set of test tubes marked to 5 cc and 10 cc, and rack; and one calibration chart. The chart shown herewith is sufficient for semi-quantitative estimation.

Procedure: Measure 5 cc of water sample into a test tube; add 10 drops of the 1 per cent potassium chromate solution. Add silver nitrate solution, drop by drop to the tube containing the water sample and chromate. Shake after each drop has been added. Count the drops and continue additions until a slight reddish coloration appears.

Then compute the concentration of chloride in the water by means of a calibration chart, such as is shown herewith. If more than 25 ppm of chloride are present, the possibility of cross-connection with sea water should be investigated



6000 gallons or ten percent of the original reservoir capacity.

A 100 part per million chlorine solution was next prepared in the fire-truck tank. The entire interior of the reservoir was then hosed down under pressure, thoroughly cleaning and sterilizing it. A complete inspection of the concrete walls and floor was made and numerous cracks were grouted and plastered.

The operation was completed at 6:00 AM. The well pump was started at 6:30 AM. and chlorine solution was added to the reservoir.

There are several points to consider in performing such an operation as the foregoing. Preparatory planning is all-important, so that all the necessary equipment is at hand when work begins, and so that the time involved is a minimum. Such work should be accomplished during the hours of least water consumption and all other available storage, such as elevated tanks, should be brimfull at the beginning of the work in order to have fire protection for the community during the work. Sterilizing agents should be generously used.

• • •

Skilled Foreman Saves Money on Road Construction

We built a tar highway over a hill in accordance with State Specifications in one-third the time that many other similar projects over the state have required and at a cost about half that of similar projects in this town previously. We hired as foreman for the work a contractor, Lester E. Wiley, of Norway, whose equipment was at the time at work elsewhere. Much of the credit for the fine job must go to Mr. Wiley. A half-yard power shovel was used to cut off some banks, but mainly to load trucks with spoil. The TD14 bulldozer dug off most of the banks and "fed" the power shovel. As soon as the road was graded, the power shovel was moved to the gravel pit to load trucks to haul to the job. Some grading and leveling was done with a medium power grader, but more than 90 per cent of it with the bulldozer. The fill was placed in layers, so that it was compacted as it was leveled. As soon as the base was completed, the large motor grader was used to prepare it for the surfacing. Culverts were put in with the bulldozer. Clarence F. Files was State Road Supervisor.—Wm. A. Dunstan, Town Manager, Oxford, Maine.

No Garbage Gripes

(*Continued from page 57*)

we really stack the trucks full for the cleanup."

Summer schedules call for two collections a week from the more than 14,000 dwellings and business houses in the city. Winter sees the nine trucks switch to weekly refuse collections, plus weekly ash collections. When the department was originally set up, two relay units were on call for emergencies. In addition, a three-quarter ton pickup was purchased for "hot-shot" runs to handle complaints. Business was so light on this complaint truck that it soon became a trouble-shooter and superintendent's inspection truck.

This luxury service must cost plenty, you say? Strangely enough, it actually costs the city little more than the budget called for in the days when complaints were running 35 or more a day. In 1950, the Sanitation Department spent $227,645 or $5.55 per capita. This includes garbage and ash collection, sewer and street cleaning, plus snow removal

Chappell, Neb. obtains

Complete sewage treatment at low per capita cost

Aero-Accelator

provides high rate biological sewage treatment

Chappell, Nebraska, required complete biological sewage treatment. At the same time, Chappell's size (pop. 1500) would not allow a "blank check" budget. Fulton & Cramer, consulting engineers, solved the problem with an Aero-Accelator. This economical sewage unit installation provides rapid and sustained biological action with efficient clarification.

Griductor®

intercepts larger solids... reduces them by cutting and shearing

The Griductor protects Chappell's equipment from fouling and clogging. The simplicity of its straight channel installation was an added economy.

FOR MORE INFORMATION... *send for these detailed Infilco Bulletins* **6510-AP** *and* **5100-AP**

INFILCO

INFILCO INC. *Tucson, Arizona*

Plants in Chicago & Joliet, Illinois

FIELD ENGINEERING OFFICES IN 26 PRINCIPAL CITIES

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

in the winter. This amounts to 4½ per cent of the city's income. Fifteen years ago, collection services alone cost 3½ per cent of the city's income.

Originally a budget of $6,900 was set up for truck maintenance. A contract was made for a preventive maintenance program which called for close follow through on regular schedules. The nine White trucks in the fleet were placed on monthly inspections which included lubrication, tightening and general maintenance. Oil was to be changed every other month. At the end of the first six months, this maintenance cost $10.70 per month per truck. Instead of spending a budgeted $3,450 for maintenance, they spent $590.

With the increased age of the trucks, maintenance costs naturally are increasing. However, the cost per truck per month in the first six months of 1952—$47.13—still was nearly $1,000 under the budget. The trucks never miss a day in service because inspections are arranged at off-hour times. They work six days a week and none has had a major overhaul in 3½ years of hard service.

Yes, they're proud of their Sanitation Department in Poughkeepsie. And the fleet of trucks Fred Hampe runs keeps making the rounds, looking for new ways to save some time here . . . do a better job there . . . add a new service . . . all to keep garbage off the front page of *The Poughkeepsie New Yorker* and keep Mayor Stevens off the telephone

• • •

Prestressed Concrete Lecture Series

Newark College of Engineering, in cooperation with Portland Cement Ass'n., will present a series of eight lectures and discussions on prestressed concrete. These will be given on consecutive Monday and Thursday evenings from April 6 to April 30. Information can be obtained from Special Courses Division, Newark College of Engineering, 367 High St., Newark 2, N. J.

• • •

Repairing a Damaged Outfall Sewer

Because the joints in a 24-inch outfall sewer failed after repeated flooding, we had to dig it up and pour concrete joints. We bought a Schield Bantam dragline, ⅜-yd., and did the work for about one-fifth of what it would have cost by contract. Now we have our dragline and I can't see how I ever got along without it. We also had to lay 4,800 ft. of conduit under brick and concrete pavement for our white way, so we bought a 105-ft. Sullivan compressor to cut the streets. Now I can't see how I can get along without it.—**Z. O. Bourne, Sup't. of Streets & Water, Columbia (8,000), Miss.**

• • •

Georgia Highways

(*Continued from page* 61)

who are technically trained engineers, to aid in supervising the field maintenance forces in each division. The divisions are divided into 30 to 45 patrol sections, each of which is in charge of a foreman known as a patrolman. He is responsible for the routine maintenance of roads in his section and has assigned to him the necessary labor and equipment to perform this work, which consists of scraping and shaping earth roads, patching pavements, control of grass and weeds on the right-of-way and maintaining adequate drainage.

Each division also has roving maintenance crews with special equipment and labor necessary to do resealing of asphalt pavements, heavy ditching, reshaping of roadbeds and other heavy work not ordinarily performed by the regular patrol-section crews. This division also cooperates with the Construction Division in establishing, marking and maintaining detours around construction projects so that the traveling public may be inconvenienced as little as possible.

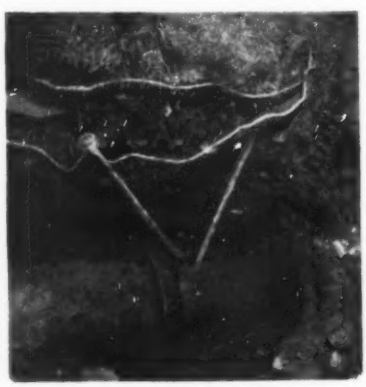
Shops for the repair and overhaul of equipment are maintained in eight strategically located towns and cities. In these, all types of repair work are done; and in addition, traveling mechanics are provided for field repair service of equipment. Two warehouses are maintained for stocks of repair parts, tools, paint, tires, batteries and other supplies commonly used. These are centrally purchased in large quantities. A shop is also operated for the preparation and reconditioning of road signs. In one year 16,683 signs were reclaimed for further use.

Since 1950 the Georgia State Highway Department has also had the job of assisting the Georgia State Patrol in the enforcement of laws governing size and weight of motor trucks. A special unit was organized for this work, which has involved the use of loadometers or portable scales, as it was found that many trucks were avoiding the permanent scales. Five crews operate these portable scales at about 75 different locations each week, so intentional violators do not know where they are likely to find a scale. This method has considerably cut down the overloading of trucks using the highways of the state.

What Clogged our 12-inch Drain Line

J. FRANCIS GRANGER,
Superintendent of Streets, Marlborough, Mass.

WE were having trouble with a 12-inch vitrified clay drain line which would not take a full flow of water, as was indicated by a manhole cover being blown off during heavy rains. It was decided to rod the drain, using Flexible sewer rods with a 10-inch cutter. We found an obstruction which we could not diagnose at first, because a smaller cutter would go through the pipe, but the 10-inch would not.



I decided to excavate at the point of the apparent obstruction. Much to my amazement, we discovered three ground rods driven at the base of a pole to ground the transformer, and two of these rods had been driven completely through the sewer pipe, making a V, with the apex of the V at the inside top of the pipe. This had collected debris and acted as a basis for the blockage.

I have never seen nor heard of a situation like this before and thought that the readers of *Public Works* might like to know about it.

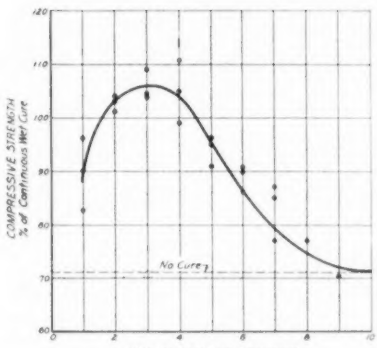
PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Delay in Applying Curing Compounds to Concrete

Tests were conducted in California to learn the relation between the time of applying membrane curing compound to a concrete pavement, expressed in terms of hours expired since the concrete was mixed, and the compressive strength expressed as the percentage of the strength of the same concrete cured continuously with a water-saturated blanket. The curve shown in the accompanying illustration is plotted from the results of three such tests. It shows that exaporation of water is beneficial during the period that the concrete is plastic and is bleeding due to the settlement of the solid particles. This process continued for about three hours and then, if further loss of water is not prevented, the resulting strength of the concrete is seriously impaired. If the curing treatment is not applied for about seven hours, its value is largely lost. The optimum time of applying the curing medium probably varies within limits that are not too wide, according to the materials used, the consistency of the concrete, the depth of the section and the availability of external moisture. It is a good rule to follow that intentional curing should start immediately after the water sheen has departed from the surface.

Bailey Tremper—"Effect of Delay in Applying Membrane Cure to Concrete;" *California Highways*, December.



Courtesy Calif. Hwys. & P. W.

● **EFFECT of time factor in using curing compounds.**

Constructing Road Through Montezuma Swamp

In constructing the New York Thruway, a 4-lane divided roadway through Montezuma Swamp and State wild life sanctuary, nearly 3 miles is in muckland. This muck is 2 to 10 ft. deep down to a layer of marl the thickness of which varied from 3 to 7 ft.; under which is a 60-ft. layer of unstable silt. The soils department had determined that the marl would support in excess of 300 lb. per sq. ft. The road was designed on the basis that all muck should be removed between established lines down to the marl and replaced with good embankment material. Draining the land would have interfered with its purpose as a wild life sanctuary; in fact, 19,400 ft. of dikes were built around the work to maintain a prescribed water level during construction. The embankment was worked over with bulldozers and sheepsfoot rollers in successive 6-in. layers

The following observations were made during construction:

1. A primary lift much in excess of 3 ft., plus the weight of the bulldozers used in leveling, would start a marl wave in advance of the fill which was difficult to control once started.

2. While the 3-ft. lift would support the hauling equipment within 15 ft. from the edge of the fill, dumping this close to the nose of the fill would start a marl wave ahead. This could be overcome by dumping 30 to 50 ft. back and pushing dirt over the edge with bulldozers, taking precautions to have but one machine at the edge of fill at any time. Thus, the primary lift would take a rolling with the 37-ton roller within 15 ft. from the edge of the fill in most cases without apparent movement of the underlying marl.

3. Where marl waves developed, the best method of handling was to remove the marl wave to the elevation of the original marl, cap with the 3-ft. lift, then build up to dike elevation as rapidly as possible.

4. In one case underlying silt broke through the marl layer and boiled 5 ft. through the fill. The fill was allowed to remain for one week undisturbed by traffic, at which time free water disappeared from the silted area. The free silt cones on top of the fill were then removed. It was discovered that the silt, under traffic and fill loads, had reached the top of the fill through vertical piping holes with a diameter of about ¼ in.

The area supported the pneumatic tired roller without appreciable settlement. The fill was excavated to within 3 ft. of the marl layer, at which point compaction tests showed 97% of maximum dry density.

William Robinson — "Thruway Problems in Montezuma Swamp;" *Roads and Streets*, December.

Bailey Bridge Parts for Emergencies

The Wisconsin State Highway Com'n in 1916 purchased Bailey bridge parts from the War Dept. and has found them very valuable in emergencies and for temporary spans. Some of the parts have been reused several times. Altogether 16 bridges have been erected with this material. They can be erected without the use of power equipment, but a medium-size tractor

with a front-end loader was found to be a great asset. They are best adapted to spans of not more than approximately 100 ft. If a bridge longer than this is desired, it is more satisfactory to drive a pile bent and erect a two-span structure. Under average difficulties, with the material piled at the bridge site and using a crew of about 10 inexperienced men, a single-single 30-ft. span can be erected in about 75-man-hours; a single-single 60-ft. span in 150 man-hours; a double-single 60-ft. span in 200 man-hours and a double-double 150 ft. span in 750 man-hours.

M. W. Fisher—"Bailey Bridge Parts for Insurance;" *Better Roads*, December.

The Radiotelephone In Highway Operations

The growth in the use of radio by highway departments since 1949 has been characterized not only by a large number of new users each year, but also by the rapid expansion of radio coverage in departments that had originally installed radio on a small-scale trial basis. There are now more than 100 highway departments using radiotelephone. Their services cover one-third of the land area of the United States. Many state highway departments have exchanged radio facilities with the state police, so that each service can quickly inform the other of matters requiring attention. Data on the cost of radiotelephone service collected by Bureau of Public Roads show that one highway department charges 11c. an hour rental while equipment is in operation. It is claimed that this charge fully covers the cost of equipment depreciation, repair and operation. Another highway department charges $7 a month for the same service. A third department charges $4.25 an hour for 54 radio units operating in 100 trucks. This is a cost of 8c. per hour per radio unit, but it covers management of the entire 100 pieces of equipment.

Generally a base station costs about $2,000. Mobile units cost from $600 to $700, depending on the type of service.

In summary, two-way radio provides (1) a saving in travel time and mileage for supervisory employees; (2) better utilization of equipment, and thus a reduction in the number of units needed; (3) better timing of labor, material and equipment services, which lowers production costs and results in a general speed-up of all operations, and (4) better public relations and improved highway transportation service.

H. A. Radzikowski — "Radio Speeds Highway Operations"; *Better Roads*, December.

Financing Toll Roads

Toll roads are far more popular than a few years ago. The public, the truckers and most state governments want them; even the federal government is only mildly opposed now. Over 750 miles of toll road are in operation in the states of Maine, New Hampshire, New York, New Jersey, Colorado and Pennsylvania and nearly 1200 more are under construction in New York, Oklahoma, West Virginia, New Jersey and Ohio. These include the 25-mi. Westchester Co. Parkway and the New York State Thruway (535 mi.); Pennsylvania Turnpike (327 mi.); Ohio Turnpike (241 mi.); Garden State (N. J.) Parkway (180 mi.); Florida's Overseas Highway (122 mi.); the New Jersey Turnpike (118 mi.) and nine

CONSTRUCTION CASTINGS
for Highway • Municipal • Building
Industrial • Communication
Public Works • Airport
Utilities • Transportation
Patterns for 15,000 different Gray Iron Castings used on Construction Projects.
Write for our 135-page
Catalog "R," Second Edition
NEENAH FOUNDRY CO.
NEENAH, WISCONSIN
Chicago Office 308 W. Washington St., Chicago, Ill.

Now's the time to mail this month's Readers' Service card.

others of less than 100 mi. each. Also eight other states are considering the use of this method of financing primary highways. It is generally believed that the tolls collected on these roads will suffice to pay the interest and debt amortization on the cost of their construction. But the best toll road locations are being picked first; later projects may not carry enough traffic, at least during the first few years, to pay for maintenance and the debt charges. To permit construction of such roads the author suggests several methods: The credit of New York state is behind the bonds of the Thruway to the extent needed beyond the income from tolls. Oklahoma state is paying for 10 to 12 miles of a 100 mile toll road. Direct contribution by the federal government and purchase of bonds by the Reconstruction Finance Corporation made possible the construction of the Pennsylvania Turnpike. A 200-mi., 4-lane project in W. Va. was changed to a temporary 90-mile, 2-lane to make it financable. In Pennsylvania and Authority has the right to issue bonds for construction and rent the facility to the state for enough to pay the interest and retire the bonds. In Colorado, up to 30% of the annual cost of operating a toll road can be taken from state highway funds. Another suggestion is the issuance of second-mortgage bonds, with interest and amortization only when earned after first mortgage charges. Tolls so far charged have ranged between 1c and 1½c per mile for passenger cars, except that they are higher on part of the N. J. Turnpike. Possibly higher rates would be practicable. The state tax on gasoline sold along the toll road might be returned to the toll road authoritiy.

Farley Gannett—"Border Line Toll Roads Have Possibilities;" *Engineering News-Record*, Dec. 25.

Snow Poles In California

Five crews last fall drove approximately 7,000 poles along U. S. 395, to prevent users of the highway from losing themselves; during the blizzard-type storms the poles are often the only indication on the wind-swept plain of the road location. Even the "Snogos" use them as a guide in opening the road. Metal poles are used, U-shaped in section, 4 in. wide and 10 ft. long, painted orange, driven 1 foot deep with an 8 lb. sledge. They are driven about 13 ft. from the center

Here's exactly what you need for quick, economical pavement repairs and small surfacing jobs . . . in any season . . . under wet or dry conditions. It's the McConnaughay HTD-B Mixer, precisely engineered and rigidly constructed to handle on-the-job mixtures of asphaltic concrete, sheet asphalt, sand asphalt or mastic asphalt . . . hot or cold . . . at remarkably high rates. It will enable you to meet all conditions with least effort and at lowest possible costs the year 'round. Write, wire or 'phone today for details and specifications.

No Other Machine Can Do ALL These Things!

Reactivate and heat stock pile mixture—up to 10 tons per hour.

Prepare cold asphaltic mixtures —up to 10 tons per hour.

Prepare hot asphaltic mixtures —up to 5 tons per hour.

Dry various types of wet aggregates quickly, thoroughly.

Remove both moisture and solvents from bituminous mixtures.

Produce bituminous mixtures with tars, paving asphalts, cut-back asphalts, and emulsified asphalts.

K. E. McCONNAUGHAY
LAFAYETTE 4, INDIANA

Need more facts about advertised products? Mail your Reader's Service card now.

line of the road; in open country on the side against the prevailing wind, on hillsides on the down-hill side; approximately 66 to the mile in open country, also on curves, at culvert markers, ends of guard rails, etc. according to judgment. Strong winds cause the poles to vibrate so that they appear to be a foot wide when viewed from a distance. Attaching sheets of Scotchlite or standard reflectors to the poles caused them to stand out in calm weather but they were not visible during snowstorms.

W. L. Savage—"Driving Some Pole Life Lines in Mono County, Calif."; *California Highways*, December.

Controlling Falling Rocks

Falling rocks have been a menace along a portion of Highway 99, north of Vancouver, Wash. To protect the highway, a nine-acre screen was erected along portions of this highway where falling rocks were a particular danger. The type of mesh used and the method of erecting the screen are described.

Art Wintle—"Nine-Acre Screen Protects New Highway From Falling Rocks"; PUBLIC WORKS, January.

Holes Without Holdups

Traffic under a city street is probably greater in volume than that on its surface. Consequently, pavement cuts must be made, manholes must be opened, and other obstructions to surface traffic created in order to keep the subsurface traffic moving. Good management can permit maximum surface use of the street, while attending to subsurface needs. This article tells of the Los Angeles studies and describes the procedures that have been worked out there.

"Holes Without Holdups"; PUBLIC WORKS, January.

Equipment in Highway Maintenance

A tractor-mounted trencher is used by the Kansas Highway Commission to trench for longitudinal drains along the pavement edge. A machine for spreading aggregate has been adapted to place aggregate in the resulting trench. A heater-planer is used to soften the surface of rough bituminous roads and is followed by a light power blade and a roller. A rotary-type mower, with a cutting width of 80 ins. has been found to speed up roadside mowing.

L. J. Siler—"How Equipment Helps in Essential Maintenance"; PUBLIC WORKS, January.

BIBLIOGRAPHY

Better Roads

Bailey Bridge Parts for Insurance. By *M. W. Fisher*, Maint. Engr., Wisconsin H'way Com'n. December, Pp. 23-24, 36.

Build Plant-Mix or Road-Mix Mats? Forum discussion. December, Pp. 27-29, 44.

High-Speed Expressway in Detroit. December, Pp. 30-31.

Dustless Surfaces Meet Approval of Public. By *E. S. Ward*, H'way Engr., Kandiyohi Co., Minn. Pp. 34, 36.

County Pay and Work Standards Studied. By *B. Loyal Smith*, Co. Engr., Walla Walla Co., Wash. December, Pp. 38-42.

California Highways

Left Turns! Their Elimination Greatly Reduces Collisions in Rodeo. December, Pp. 24-25.

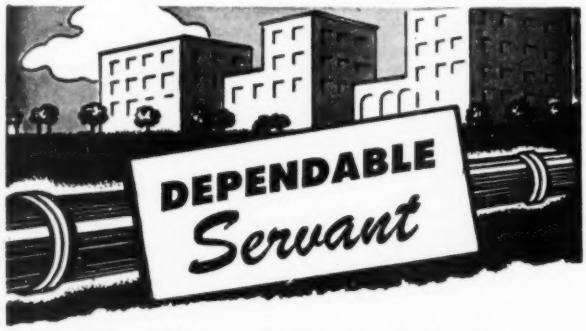
Effect of Delay in Applying Membrane Cure to Concrete. *By Bailey Tremper*, Materials & Research Engr. December, Pp. 26-27.

Driving Snow Poles in Mono County. By *W. L. Savage*, Asst. Dist. Maint. Engr. December, Pp. 42-43.

Civil Engineering

Short-Span Prestressed Beams Carry Highway Bridge in Danvers, Mass. By *J. C. Rundlett*, Bridge Engr., Mass. Dept. of Pub. Wks. January, Pp. 37-41, 108.

The New Scythette
POWER SCYTHE
CUTS WEEDS, GRASS, REEDS 4 TIMES FASTER THAN ORDINARY METHODS
NEW POWER • NEW ENGINEERING
Now equipped with double power, double fuel capacity. Trims weeds on rocky or uneven ground. Cuts grass or weeds close to buildings. Clips reeds or underwater growth. Cuts with ease wherever a man can walk, wade, or row a boat. Equipped with new two h.p. motor, one quart capacity gas tank, 20-inch oscillating cutter bar. Weighs only 26 pounds.
a twist of the wrist and the SCYTHETTE becomes the Sawette
America's most revolutionary chain saw cuts trees, or any growth up to 6" in diameter, level with terrain while operator is in upright position.
WRITE FOR FREE LITERATURE
Hoffco, inc.
RICHMOND, INDIANA



Dependable because they are tough and rugged. Made to withstand the wear and tear of the modern day strain and stress. For generations of incomparable service, only cast iron pipe can qualify. Serving the industry with Super de Lavaud Cast Iron Pipe, centrifugally cast, in modern lengths.

General Sales Offices
ANNISTON, ALABAMA

We invite inquiries to our nearest sales office

122 So. Michigan Avenue, Chicago 3, Ill.
350 Fifth Avenue, New York 1, New York

ALABAMA PIPE COMPANY
ANNISTON ALABAMA

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Contractors Record (England)

Depreciation and Maintenance of Contractors' Mechanical Equipment. By *S. Howard Withey*, Dec. 17, Pp. 19, 21, 23.

Engineering News-Record

Border-line Toll Roads Have Possibilities. By *Farley Gannett*, Cons. Engr. Dec. 25, Pp. 41-43.

Municipal Engineering (England)

Soil Cement Roads. By *K. E. Clare* and *J. S. Tanner*, Road Research Laboratory, Dec. 19, Pp. 384, 386.

Roads and Engineering Construction

Soil Densification by Vibrator-Compactor Was Feature of Killaloe Airport Job. By *Fred R. Inglis*. December, Pp. 87-88, 120.
Plastic Material Used as Basis of Day-Night Road Signs. December, Pp. 90, 120.
Highway Planning and Administration. By *Genl. Frank D. Merrill* Com'r, New Hampshire Dept. of Pub. Wks. December, Pp. 98-100, 102, 104.

Roads and Road Construction (England)

Visibility of Kerbs at Night. By *R. S. Millard*, Road Research Lab. December, Pp. 352-353.
Traffic Lines: Their Use and Application in the United States. By *E. W. W. Richards*. December, Pp. 354-356.

Roads and Streets

Thruway Problems in Montezuma Swamp. By *William Robinson*, Dist. Engr., N. Y. State Dept. of Pub. Wks. December, Pp. 44-47, 51.
The Contour Method of Grade Design and Earthwork Calculation. By *C. V. Kane*, Dist. H'way Engr., Calif. Div. of H'ways. December, Pp. 53-58.
Bituminous Soil Stabilization in Kansas. By *Delbert L. Lacy*, Field Soils Engr., Kansas H'way Com'n. December, Pp. 72-76, 86.
Asphalt Membranes—Their Potential Uses in Highway and Airfield Pavement Design. By *Jewell R. Benson*, Projects Engr., Asphalt Inst. December, Pp. 78-80.
Power Auger Drills and Their Use in Highway Work. By *C. G. Johnston*, Engr. of Soil Mechanics, W. Va. State Road Com'n. December, Pp. 81-118.

The Surveyor (England)

Lower Tampa Bay Toll Bridge Uses British System of Prestressing Concrete. Dec. 6, Pp. 781-782.
Treatment of Open Textured Asphalt Carpets. By *Walter Brundan*, County Surv. Dec. 27, Pp. 829-831.

• • •

Handling Traffic and Water Problems

We install all service laterals by means of water pressure and we lay all mains up to about 1500 ft. long by force account with rented equipment. On jobs exceeding this length, we contract the work. We own and operate our own pumping and purification system and our plant is fully equipped and protected with emergency and standby equipment. In addition to being Water Department Engineer, I am also Police Traffic Officer. We paint and mark all road surfaces for center and stop lines, car stalls, etc. We install all traffic control signs. I design and recommend traffic signal installations and off-street parking lots. At present we operate 503 parking meters in the business section.—Herman A. Klenner, Water Dep't. and Police Traffic Engineer, Rahway (21,000), N. J.

Water Pollution Control in Georgia

NEW problems in municipal and county water supply and sewerage were outlined in the 1952 report of W. H. Weir, Director of Water Pollution Control for Georgia. As usual, his report was the first one covering 1952 activities that was received in this office. Following are extracts from his report:

Due to the rapid movement of population to the cities and towns, many water and sewerage systems previously considered adequate for the next fifteen or twenty years are now know to be overloaded. Reappraisal of municipal growth plans has been necessary. Future planning must now be expansive rather than for a static condition. Excellent progress is being made in many municipalities and counties in planning and constructing water and sewage works facilities on the basis of future expansion. Replacement

SEE YOUR PROBLEMS—SEE THE ANSWERS

OUR ENGINEERS CAN SHOW YOU HOW TO
SPEED UP YOUR PLANNING
PRESENT YOUR PLAN FORCEFULLY

WRITE US FOR MORE INFORMATION—A QUOTATION—OR HELP IN WORKING OUT YOUR SPECIFICATIONS.

SEND FOR LITERATURE THAT DESCRIBES HOW PUBLIC WORKS ENGINEERS HAVE SAVED TIME AND MONEY WITH AERIAL SURVEYS.

ABRAMS AERIAL SURVEY
CORPORATION
LANSING 1 MICHIGAN U.S.A.

Get full details of this month's new products . . . mail your Readers' Service card today.

of inadequate facilities as well as construction of entirely new systems is going ahead at an accelerated rate. In general, financing of water and sewage works is being accomplished very satisfactorily by revenue anticipation certificates with direct service charges on consumption of water and sewerage usage.

A distinctive feature of recent suburban growth is the development of water and sewerage systems under county ownership. This is a new activity for county governments but must be expanded by means of independent systems or combined with the adjacent municipal facilities.

Georgia is in the forefront of industrial development in the Southeast. Many of the new industrial plants are large users of water and producers of manufacturing process wastes. Each producer of industrial waste is responsible for its treatment or adjustment to the receiving stream. Industrial managements seeking sites for new chemical processing plants are including stream investigations and surveys in the preliminary studies before locations are selected. Provision for industrial waste treatment is included in the manufacturing plant construction budget together with an operation cost item to maintain stream protective facilities. Pilot plant operation is being continued by a few industries having large quantities of wastes which, without adequate treatment, are unsatisfactory for discharge into the receiving stream. The results obtained in these pilot plants will guide the design, construction and operation of full scale treatment facilities or indicate process changes to reduce the quantity of waste or its stream deteriorating characteristics.

National Defense Impacts

The construction of additional national defense manufacturing installations and military posts, camps and stations within or near the boundaries of the state is bringing a large influx of industrial and military service personnel and their families to areas whose water and sewage facilities are either limited or non-existent. In some cases emergency measures have been resorted to until a basis of future planning could be determined and programs of permanent construction with a workable degree of accuracy have been adopted. Public financing of immediately needed community facilities to meet the sudden impact of such unexpected loads is difficult because of the uncertainty of the permanence of the need for such greatly expanded utilities. However, even under the uncertainties of migrating populations, some order in providing water and sewage facilities in critical areas is replacing the initial chaos with resulting substantial progress.

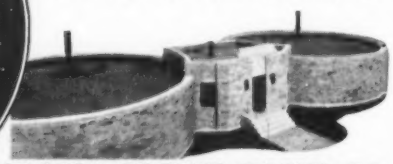
Disaster Relief

In May, 1952, a tornado of high destructive force struck through the center of Alapaha demolishing the elevated water tank and damaging the deep well pumping equipment to make it inoperative. With the public water supply completely out of service, emergency measures were put into effect by disaster relief forces to establish an improvised central watering point for drinking and culinary water only. Within a few hours after the disaster was announced, the Division of Water Pollution Control was able to locate an available pneumatic tank at a distance of about one hundred miles from the disaster point. Through the generosity of a water works contractor and the utilization of a heavy capacity transport

P.F.T. FLOATING DIGESTER COVERS

For Population Loadings from 500 to 5,000,000

Thousands of communities with P. F. T. Floating Cover Digesters enjoy safe carefree operation. P.F.T. Covers provide complete submergence of buoyant sewage solids, more effective and safe collection of sewage sludge gas and more complete digestion. Effective digestion control regardless of what loading or what portion of tank capacity is employed. Consult P. F. T. Engineers for complete data.

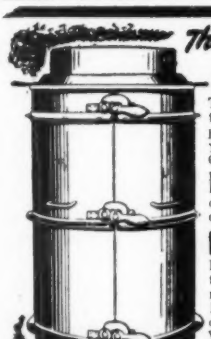


P.F.T. **PACIFIC FLUSH TANK CO.**

Waste Treatment Equipment Exclusively Since 1893

4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER



The "Quinn Standard" FOR CONCRETE PIPE

The Quinn Standard is known as the best the world over, wherever concrete pipe is produced and used. Backed by over 35 years' service in the hands of hundreds of Quinn-educated contractors, municipal departments and pipe manufacturers who know from experience that **Quinn pipe forms** and **Quinn mixing formulas** combine to produce the finest concrete pipe at lowest cost.

QUINN HEAVY DUTY PIPE FORMS

For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 18" up to 120" and larger—tongue and groove or bell end pipe at lowest cost.

WRITE TODAY. Complete information, prices, and estimates sent on request. Also manufacturers QUINN CONCRETE PIPE MACHINES.

QUINN WIRE & IRON WORKS 1621 12TH ST. BOONE, IOWA

M-SCOPE PIPE — LOCATOR

Light Weight Model AB

Only $149.50

Superior Performance at *Lower Cost*

Pipe Finder — Leak Detector Combination Type BL $197.50

Free Illustrated Lit.

FISHER RESEARCH LAB., INC.

PALO ALTO CALIF.

for CAST IRON PIPE

CALL OR WRITE

McWANE Cast Iron Pipe Company, Birmingham, Ala.

Pipe sizes 2" thru 12"

Sales Offices

Birmingham 2 Ala., P.O. Box 2601
Chicago 1, Ill., 333 North Michigan Ave.
New York 4, N. Y., 80 Broad Street
Kansas City 6, Mo., 1006 Grand Avenue
Dallas 4, Texas, 3200 Maple Avenue

PACIFIC STATES Cast Iron Pipe Co., Provo, Utah

Pipe sizes 2" thru 24"

Sales Offices

Provo, Utah, P.O. Box 18
Denver 2, Colo., 1921 Blake Street
Los Angeles 48, Cal., 6399 Wilshire Blvd.
San Francisco 4, Cal., 235 Montgomery St.
Portland 4, Oreg., 501 Portland Trust Bldg.
Salt Lake City, Waterworks Equip't Co.
Seattle, Wash., Smith Tower Bldg.

vehicle of the Army, the tank was hauled and placed in position in Alapaha. Water works superintendents in neighboring towns rendered assistance with other repairs to restore a safe and nearly normal water service to the town in the shortest possible time.

Manganese in Reservoirs

The presence of manganese in more than one or two tenths of a part per million in a public water supply usually renders the water unsatisfactory for many industrial and domestic purposes and undesirable from an aesthetic standpoint. Manganese, in varying amounts, occurs in geological formations over wide areas of the state but under normal conditions of stream flow very little goes into solution; consequently, it has not presented a general problem in the past.

However, in recent years the construction of impounding reservoirs by Federal agencies, municipalities, industries and private individuals has created conditions along several streams favorable for the ready solution of minerals containing manganese and other elements. This is due in part to the depletion of oxygen, formation of carbon dioxide and increase of hydrogen ion concentration (lowering of pH) which frequently occurs in the bottom stratum of such reservoirs.

At times the water leaving these reservoirs contains manganese in amounts sufficient to be objectionable to downstream consumers since it is not readily removed by the methods of treatment most commonly employed in purifying the soft, turbid waters in this area. The Water Pollution Control Division has devoted considerable time in helping various water departments set up research projects or modified treatment methods to combat this problem and several plants are now handling the situation in a satisfactory manner.

• • •

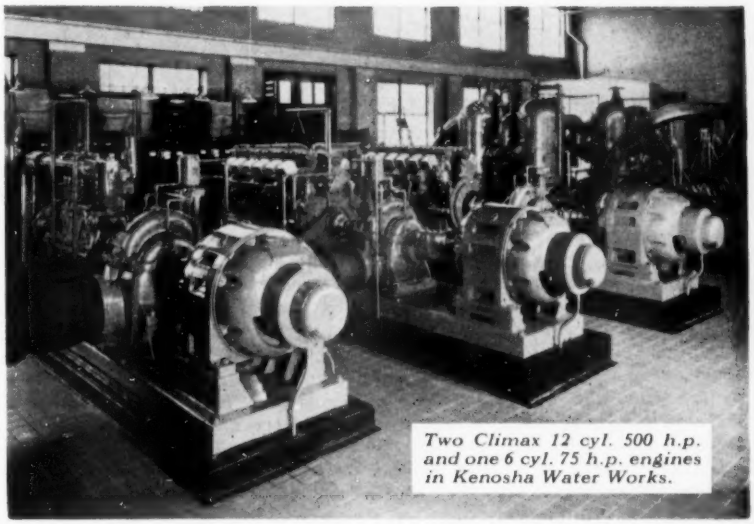
Detergents in England

Luton, England, discharges its sewage into the river Lea. It has been ordered by the courts to treat the sewage, one reason being, as stated by the court, that "The introduction of synthetic detergents caused the water in the river to froth up whenever it was agitated, and foam sometimes rose to six feet and blew all over the countryside."

"That terrible phenomenon must be tackled with the utmost energy," Mr. Justice Vaisey added.

climax BLUE STREAK ENGINES

PROVIDE DEPENDABLE PROTECTION



Two Climax 12 cyl. 500 h.p. and one 6 cyl. 75 h.p. engines in Kenosha Water Works.

ON RECOMMENDATIONS of Alvord, Burdick & Howson, Engineers, the Water Works Department of the City of Kenosha, Wisc. elected to abandon rather than enlarge the existing steam plant and spent approximately $200,000.00 in modernizing and enlarging its pumping station.

Improvements included the addition of two motor driven 9 MGD high lift and one motor driven 10 MGD low lift centrifugal pumps. To provide dependable standby protection each of the high lift pumps is also direct connected through a quick detachable coupling to a 500 H.P. Climax gasoline engine and the low lift pump is similarly connected to a Climax 75 H.P. gasoline engine.

The present total capacity, including an existing 15 MGD motor driven pump, is 43 MGD, or 28 MGD SAFE capacity protected by standby engines. This is estimated to be ample for fire and domestic needs for an anticipated population of 170,000 by 1970.

In the Sewage Treatment Plant at Kenosha two Climax 75 H.P. sewage gas engines have been driving raw sewage pumps since 1940. Each of these engines has given over 59,000 hours of service.

climax

ENGINE AND PUMP MFG. CO.

Factory and General Office: Clinton, Iowa
Regional Offices: Chicago, Ill., Dallas, Texas

Now's the time to mail this month's Readers' Service card.

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Experience with Multiplex-Treatment Purification Units

In 1950 there was constructed at Alexandria, Va. a purification plant which used standard methods of coagulating, mixing, sedimentation, filtering and chlorinating, but the construction of which differed in almost every respect from common practice. (See the *Digest* for July 1951). Briefly, the plant contains four units, each of 2.25 mgd capacity. Each unit consists of a steel tank divided by concentric steel partitions into a central mixing compartment 24 ft. in diameter; surrounded by an annular settling compartment 26 ft. wide; and this again by an annular filter compartment 3 ft. wide, separated from the settling compartment by an annular washwater drain gullet 1 ft. wide. The water depth in all compartments is 15 ft., except that the drain gullet is filled with concrete to a short distance below the top. The filtering material is 30 in. of sand on carborundum plates. In normal operation there is 8 ft. head of water on the sand bed, and there is no negative head below and in the filter. Since this filter was built two similar ones have been installed, of the same general construction. The operation of the plants is remotely controlled pneumatically. The costs of construction of this plant have been between $70,000 and $82,000 per mgd capacity, compared to the $100,000 to $200,000 for conventional plants. Other advantages claimed are: minimum floc disintegration due to turbulence; air binding eliminated. Low percentage of wash water used; operation as upflow unit possible if properly proportioned; and inclusion of practically all refinements of mixing and settling tanks now in popular demand.

E. H. Aldrich—"Multiple-Treatment Units for Water Purification;" *Journal, American Water Works Ass'n*, December.

Prestressed Concrete Dams

So far no large new dam has been designed and constructed as a prestressed structure, but prestressing has been applied with great advantage to increase the stability and height of existing dams in Algeria. With the advent of prestressed concrete, dam design has been completely revolutionized by French engineers and it is likely that, so far as France is concerned, the normal gravity dam has been superseded by the prestressed or arc dam to which the principle of prestressing is incorporated as a vital part of the design.

Prof. R. H. Evans—"Prestressed Concrete Dams and Tanks;" *The Surveyor*, Dec. 13.

Slurry Feeding of Activated Carbon

The Chicago South District Filtration Plant in 1948 used 2,807,950 lb. of activated carbon, as much as 84,842 lb. in a day, all dumped by hand from 35 lb. bags, into nine dry-feed machines. In addition to the labor of dumping 2,000 or more bags a day the bags had to be burned; much dust escaped into the building, and it seemed necessary to adopt some different procedure. That adopted was to obtain the carbon in bulk, dump it from the car directly into two tanks containing water, wait for the carbon to absorb water and settle, then mix by rotating paddles to obtain a uniform slurry, and pump this through pipes to the point of application. The carbon "wets" very slowly; most of it required 3 to 5 days, and some of it 12 to 22 days. Wetting from the top with a hose and then a spray seemed to retard rather than hasten the wetting period. A mixture of 1 lb. of carbon per gallon can be pumped easily. The carbon is very abrasive. Using rubber-lined pumps, the rubber deteriorated rapidly. Stainless steel in a Mayno pump is now used and giving good service. The circular steel slurry tanks are protected by use of Bitumastic; difficulty is experienced in maintaining the coating. Two square concrete tanks for this purpose are under construction.

John R. Baylis—"Slurry Feeding of Activated Carbon;" *Journal, American Water Works Ass'n*, December.

Micro-straining as a Pre-filtration Measure

To relieve the increasing burden on the slow sand filters which purify the water supplied by the Roughrigg, Scotland, water works, micro-straining has been adopted. Two machines were installed capable of straining 3 to 4.5 mgd. Each has a drum 7 ft. diameter and 5 ft. long, with their cylindrical surfaces covered with stainless steel micro-straining fabric with nearly 80,000 0.001-inch apertures per sq. in. Raw water flows into the drum and passes out through the fabric. The solids strained out are continuously washed off by very fine jets of water. This treatment allows the sand filters to operate more rapidly and efficiently. The approximate cost of the micro-straining machines and installation was £13,000.

"Mechanical Filtration Relieves New Water Demands;" *Municipal Engineering*, December 12.

Improving Wells by Vibratory Explosives

Use of vibratory explosives has been perfected in California for redeveloping wells whose yield has diminished, also for original development and removal of growths. In this method, special explosives are spaced on leads and suspended in the well at various depths opposite the well screen or perforated area, the strength of the several charges increasing with their depth of submergence. They are then detonated

at predetermined intervals, producing a continuous series of shock waves of relatively long duration, powerful enough to shatter and dislodge obstructions in the perforation or in the interstices of the surrounding formation. The gas bubble formed by each detonation expands and contracts approximately ten times, forcing water back and forth through the perforations. Immediately following each such cycle, the next charge is detonated, and this is repeated until all have been detonated. The well is then surged with the pump and the residue pumped out. Records of 32 wells so treated show improvements varying from 20 to 417% and averaging 139%.

Harvey A. Mylander—"Improving Well Yields by Use of Vibratory Explosives;" *Water & Sewage Works*, December.

Radial Collector Wells in West Virginia

Thirteen wells of the radial collector (Ranney) type have been built along the Ohio river in West Virginia. They indicate that an initial yield of 2.0-4.5 mgd per well can be expected when the river is at pool stage. The yield of some may decrease measurably in a 3-6 year period. The oldest of them has been in use for ten years only, and a longer record is needed to determine their effective life. Probably the well capacity can be restored by redevelopment. The water from these wells is clear, has excellent bacterial quality, is free from taste and odor, and has a fairly uniform temperature. Some of the wells are recharged by normal ground water, some by infiltration from the river. The latter have a carbonate hardness appreciably higher than that of the river. Based on current cost, a radial collector well alone will cost approximately $20,000 to $40,000 per mgd capacity, depending on the yield obtained.

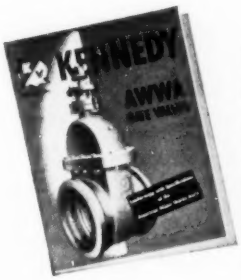
H. K. Gidley—"Installation and Performance of Radial Collector Wells in Ohio River Gravels;" *Journal, American Water Works Ass'n*, December.

Lessons from an Earth Dam Failure

An earth dam constructed 83 yr. ago at Harrogate, England, failed in December 1951, and studies of the failure resulted in the forming of several conclusions. This was a normal earth embankment with a clay core, having a maximum height of

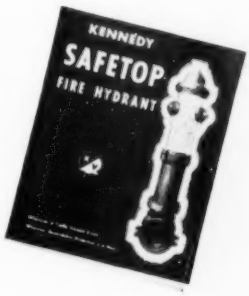
Ask for this complete reference library on KENNEDY valves and hydrants

It's specially designed to make your specifying job easier. These three handy, easy-to-use booklets describe the complete KENNEDY line of A.W.W.A. valves and fire hydrants.



To help you specify A.W.W.A. valves, KENNEDY Bulletin 106 gives detailed specifications . . . lists the wide range of types, sizes, controls accessories, connections, and gearing arrangements available. It's packed with facts you'll want for reference material in your permanent file.

See how one man can repair a KENNEDY SAFETOP hydrant in only 11 minutes. KENNEDY Bulletin 105 tells the complete story . . . how the easily replaceable threaded breaking ring breaks cleanly under an unusually heavy blow . . . and how one man, with only a few common tools, can put it back on the job in a very few minutes.



When you want low-cost dependability in hydrants . . . KENNEDY Bulletin 109 describes all the dependable, money-saving features of KENNEDY STANDARD hydrants. It also gives full details on the various accessories and nozzle arrangements available with these hydrants.

The complete set of 3 booklets is yours for the asking. Write today for Bulletins 105, 106, and 109.

Est. 1877

THE KENNEDY VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

29 ft. above natural ground level. Among the lessons learned were the following: Such dams have a limited life and their factors of safety inevitably decline; and those constructed before the advent of soil mechanics should be suspect. Ordinary visual inspection of a dam, unsupported by any real knowledge of the properties of the materials of construction, is insufficient to determine the stability of the structure; numerous soil tests are essential to this. Tests of some clays may seem to indicate a satisfactory factor of safety during dry weather, but after prolonged percolation their factor may be less than one. Any free-draining material within an embankment comprised of clay or silt may either drain it or may feed water to it and weaken it.

Delwyn G. Davies—"The Harrogate Dam Failure;" *The Surveyor*, Dec. 13.

Controlling Tastes and Odors

At the annual conference of the AWWA last year, a number of water works officials described their efforts to eliminate or diminish tastes and odors which became pronounced each spring in the waters of the Missouri, Cedar, Iowa and other rivers, large and small. The tastes were attributed to algae, decaying vegetation on stream beds or banks, sewage, fertilizer washed in from farm lands; and James A. Sampson reported that "Certain molds have been identified and studied in the laboratory and are known to give rise to an earthy, musty odor . . . and it may well be that these lower forms of vegetation play a greater role in producing tastes and odors in Iowa surface water than is suspected." All agreed that the trouble was decidedly worse in the spring; and that no single method of controlling taste and odor will be successful with all waters under all conditions. Among the treatments found more or less effective at different times and with different waters were aeration, coagulation, residual chlorination, filtration, and activated carbon, used singly or in various combinations. Cedar Rapids had employed chlorine dioxide successfully both as a postfilter treatment and as an addition to the settled water before secondary coagulation.

Professors and students of the University of Iowa operated a pilot plant to learn whether and how ozone could be used successfully to eliminate these tastes and odors. Ozone was used in combination with coagulation, sedimentation and filtration. They found that when the threshold odor value of the raw water was high, ozone reduced it; but when it was low, ozonation provided very little improvement. Free residual chlorination was necessary after ozonation in order to reduce the threshold odor values to acceptable amounts. Ozonation materially reduced the chlorine demand. There was an average reduction of 99.4% in the MPN of coliform organisms.

"Taste and Odor Problems During Spring Runoff" and "Action of Ozone on Tastes and Odors and Coliform Organisms;" *Journal, American Water Works Ass'n*, December.

Using Labor Saving Equipment

A Ford tractor with dual wheels, an all-weather cab, a Sherman power digger and a Dearborn loader has paid for itself many times over in labor saving. Stop box excavations that would require four hours of hand labor are dug in as little as 20 minutes, and the loader can be used to backfill the hole. For night work, not only is the unit equipped with flood lights, but Homelite portable light units are used. The loader can be used to remove snow before starting any excavation. Another valuable piece of equipment is the Ford truck with Gar Wood winch, operated by a power take-off.

Lawrence M. Bailey—"Labor Saving Equipment Speeds the Work;" PUBLIC WORKS, January

Planning a Water System

The Portland, Ore., Water Works dates back some 65 years. The development of this system from its early beginnings to the present, when it serves nearly half a million people, is traced in this article. Of particular interest are the early steps taken to obtain a source which would be ample for the indefinite future. The problem of serving the various levels in Portland is also covered. Elevations vary from 29.5 ft. to 1073 ft., requiring special pumping and storage devices.

Guy Browning Arthur — "Planning Gave Portland a Great Water System;" PUBLIC WORKS, January.

Mechanical Skimmer for Cleaning Slow Sand Filter Beds

E. L. MOSLEY.

Manager-Secretary, Board of Water Commissioners, Denver, Colo.

THE most unusual piece of equipment which we have developed recently is a mechanical skimmer for cleaning the slow sand filter bed at Platte Canon. This skimmer gathers the schmutzdecke, or dirt surface layer of the filter into windrows, from which it is now carried by tractors with hydraulic loader attachments into an injector which draws it through cast iron pipe into a sand-washing plant. Formerly, the filters were skimmed by hand. It has taken 182 man-hours of labor for the average filter bed. With the use of the skimmer and with the tractor to push the skimmer, it is now being done in five hours by one man. The skimmer cleans a swath eight feet wide. It has a separate 7½-hp motor to operate the flippers and the auger. It is pushed by an Oliver Model BG tractor. The skimmer itself was developed by the Howry-Berg Steel & Iron Works, Inc. in cooperation with the Water Department personnel. We are enclosing two pictures of this equipment and its work.

BIBLIOGRAPHY

American Water Works Ass'n Journal

Legal Problems Confronting Water Works Management. By *John H. Murdoch, Jr.*, V. P., Am. W. W. Service Co. December, Pp. 1085-1091.

Use and Operational Control of Mechanical Equipment. By *John Rian*, Dist. Supt., No. Indiana Public Service Co. December, Pp. 1092-1098.

Billing and Accounting Practices at Louisville. By *B. E. Payne*, Chf. Engr. & Supt., Louisville Water Co. December, Pp. 1099-1106.

Multiple-Treatment Units for Water Purification. By *E. H. Aldrich*, Chf. Engr., Am. W. W. Service Co. December, Pp. 1107-1116.

Installation and Performance of Radial Collector Wells in Ohio River Gravels. By *H. K. Gidley*, Dir. of San. Eng., W. Va. Dept. of Health. December, Pp. 1117-1126.

Taste and Odor Problems During Spring Runoff. Panel discussion by *Joseph F. Erdei*, Chemist, Metr. Utilities Dist., Omaha, Neb.; *Geo. S. Lee*, Prod. Mgr., Ottumwa, Ia., W. W.; *Leo Louis*, Supt. W. W. Cedar Rapids, Ia.; and *James A. Sampson*, Engr., Howard Green Co. December, Pp. 1127-1143.

Action of Ozone on Tastes and Odors and Coliform Organisms. By Profs. and graduate students, Univ. of Iowa. December, Pp. 1144-1150.

Selling Rate Adjustments to Citizens. Panel discussion by officials of six water works departments. December, Pp. 1151-1160.

Slurry Feeding of Activated Carbon. By *John R. Baylis*, Engr. of Water Purif., Chicago. December, Pp. 1161-1168.

Control of Fluoridation. By *Robert S. Jacobson*, Asst. Engr., State Dept. of Health, W. Va. December, Pp. 1169-1173.

Engineering News-Record

Packaged Waterworks Pays Off. (Alexandria, Va.) Jan. 1, Pp. 33-34, 37.

Municipal Engineering (England)

Mechanical Filtration Relieves New Water Demands. Dec. 12, P. 360.

Investigations into Swimming Bath Water Treatment. By *S. G. Burgess, D. Burns* and *C. W. Tidy*, Chemists, London County Council. Dec. 26, Pp. 403-404. Jan. 2, Pp. 429-433.

Public Works

Labor Saving Equipment at Work. By *L. M. Bailey*, Sup't., Lincoln Park, Mich. January, Pp. 55.

Planning Gave Portland a Great Water System. By *Guy B. Arthur*. January, Pp. 60, 61 and 80.

South African Municipal Magazine

Metering of Water Supplies. By *J. I. Jammy*, Water Engr. of Johannesburg. November, Pp. 5, 7, 9, 11.

The Surveyor (England)

Prestressed Concrete Dams and Tanks. By *Prof. R. H. Evans*. Dec. 13, P. 794.

The Harrogate Dam Failure. December, P. 796.

Technique de l'Eau (Belgium)

Peut-on Utiliser les Rayons Ultra-Violets Pour la Sterilisation des Eaux Potables. By *M. C. Moorrees*. December, Pp. 27-28.

Water and Sewage Works

New Design in Filter Bottoms for Rapid Sand Filters (in Holland). By *C. W. Hulsbergen*, Chf. Engr., Netherlands Govt. Inst. for Water Supply. December, Pp. 481-485.

Problems in Design and Operation of a Booster Pumping Station. By *Ross L. Dobbin*, Gen'l Mgr., Utility Com'n., Peterborough, Ont. December, Pp. 491-494.

Improving Well Yields by Use of Vibratory Explosives. By *Harvey A. Mylander*, Dist. Engr., Water Supply Analysts, Pasadena, Calif. December, Pp. 502-511.

Water Works Engineering

Manchester, N. H. Is Thrifty in Managing Abundant Supply. By *Malcolm Merritt, Jr.* December, Pp. 1130-1133, 1162.

Underwater Repair of Big Main at Elmira, N. Y. By *John G. Copley*, Genl. Mgr. of Water Bd. December, Pp. 1134, 1174.

High-Rate Water Filtration at Chicago

IN the early part of 1948, several of the eighty filters at Chicago's South District Filtration Plant, designed for the customary rate of 2 gal. per minute per sq. ft., were set to operate at rates of 4 to 5 gals. to obtain information on the maximum rate at which they could be operated with safety. The results of this test, which have received wide publicity, were so favorable that in January 1952 operation of the entire plant was changed to utilize the advantages of high-rate filtration. Thirty filters were cut out of service, leaving 50 to take care of the load; except that occasional peak demands may require that some of the idle filters be placed in operation for a few hours. The maximum number of filters required at any time during the summer of 1952 was 60; there were 21 days in which 4 to 10 additional filters were turned on for periods of 3 to 15 hr., several of which could have been

FOR TAPPING MAIN UNDER PRESSURE

M-H TAPPING VALVE and SLEEVE

For horizontal installation, tapping valves can be furnished with gears; also rollers, tracks and scrapers.

A. W. W. A.—CLASS C

Designed for tapping a main under pressure to take off a branch larger than corporation cock size. Flange on one side of valve bolts to sleeve; other side of valve may be hub or mechanical joint connection, either of which has special flange cast integral for attaching any standard make tapping machine. Can be furnished with rising stem for use in manhole or valve pit. Features of M & H sleeves are strong, heavy design and liberal length.

M & H Tapping Valve meets specification of A. W. W. A. Class C and Tapping Sleeve is Manufacturer's Standard. For complete information, write or wire M & H VALVE AND FITTINGS COMPANY, Anniston, Alabama.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION

Thousands use our Readers' Service card to keep up to date . . . do you?

avoided but the operators wished to take no chances. The ten filters originally operated at fixed high rates have been continued in operation at constant rates; the other 40 are allowed to fluctuate in rate as the load decreases or increases. During the early hours of the morning, when the consumption is low, the automatic filters may operate at close to 2.5 gpm; later in the day, as the consumption increases, they may operate at rates close to 4.5 gpm.

Data show that the filter performance (amount passing through the filter per foot of lost head) increases as the rate of filtration is increased; the reason being, it is thought, that the head loss is increasing at a faster rate near the end of a filter run than at the beginning. The average performances, in million of gallons, during 1951 were 1.07 at a 2.0 gpm rate, 1.35 at a 4.0 gpm rate, and 1.56 at a 5 gpm rate.

The data also show that the filter runs at the 4 gpm rate are slightly longer than one-half those at the 2 gpm rate. However, the fact that no filters are allowed to run more than 48 hrs. without washing favors the high-rate filters in this comparison. It is believed that, with no limitation of *time* between washings, but only of *lost head*, the 4 gpm rate will give runs one-half as long as the 2 gpm rate.

Figures for efficiency of the filters show that the high rate effluents contained zero turbidity at all times when the amount of aluminum sulfate used was that used for low rate filtration—an average of about 86.7 lb. per mg. During 1952 the dose was cut to an average of 74.3 lb. (64 lb. in February) to learn what would be a safe minimum, and at no time did turbidity at a 5 gpm rate exceed 0.40 and the average was 0.023.

In tests for coliform bacteria, the percent of positive tubes during July 1952 was 3.57 per 100 ml. presumptive and 1.73 confirmed. On occasions, the prechlorination dosage is low and some bacteria are expected to pass through the filters; but a post-chlorination dosage is used most of the time, and a few bacteria in the filtered water are of no consequence.

The above is abstracted from a report by John R. Baylis, Engineer of Water Purification, in "Pure Water", the monthly publication of the Bureau of Engineering.

Leo Ritter

(*Continued from page* 18)

for many years and are well established. Others, like the ones at the University of California, Georgia Tech, University of Florida, and Ohio State, are comparatively new on the highway scene. Meetings of this sort are currently held in about 20 states some time during the year.

No two of these meetings have the same pattern—some of them are very broad in scope, while others concentrate on specialized subjects, like traffic engineering or roadside development. All of them have one basic purpose—service to the people in the highway field. They promote cooperation among all groups concerned with highway and street problems and provide a wonderful place for the exchange of information about new (and old) developments of a technical and non-technical nature. Programs are frequently outstanding and sometimes the unrehearsed, spontaneous discussions from the floor provide ideas which are worth a hundred formal papers.

These efforts deserve your wholehearted support and we sincerely

it's a pleasure...
TO STAY AT THE
HOTEL RALEIGH...WHEN IN
WASHINGTON, D.C.
See history in the making. The Pentagon Building, the new Jefferson Monument, the Mellon Art Gallery, and many other points of historic interest. Hotel Raleigh offers elegant comfort, excellent cuisine. 400 air-conditioned rooms, reasonable rates. In the heart of official Washington . . . Drive into our hotel garage.
HOTEL Raleigh
MIDWAY BETWEEN THE WHITE HOUSE AND THE CAPITOL ON FAMOUS PENNSYLVANIA AVENUE
SPECIAL COURTESIES TO HONEYMOONERS
Write for booklet or honeymoon brochure to C. C. SCHIFFELER VICE PRESIDENT AND MANAGING DIRECTOR Or your own travel agent

NEWEST HOTEL IN MIAMI!
BISCAYNE terrace HOTEL
340 Biscayne Blvd.
Miami's newest hotel, overlooking Biscayne Bay, offers every luxury imaginable. Smart cocktail lounge and dining room . . . individually controlled air conditioning . circulating ice water . . . a radio in every room. Convenient location for both business and pleasure—write now for information or reservations
MIAMI, FLORIDA

Now's the time to mail this month's Readers' Service card.

hope you are planning to attend the one in your state this year. If you don't now have an activity like this, how about stirring up the folks at your state college or university to start one?

Construction Activity: 1953 should be quite a year for the construction industry, according to information which has recently been released. It is anticipated that construction activity will hit a new peak of $44 *billion* this year. About 75% of this will be new construction. Construction is now the nation's largest single industry, topping agriculture, and employing directly or indirectly about 7½ million people.

In the highway field 1952's peak of $2.7 billion is expected to be surpassed for a new all-time record of about 3 billion dollars. A lot of this will be due to toll road and urban expressway construction. Abnormal activity is expected in some areas, notably in Ohio, because of the Ohio Turnpike and the new atomic plant being built in Pike County. Activity will continue high in New York now that the 500 + — mile New York State Thruway is in full swing.

Construction will continue to boom in the south, which percentagewise showed the greatest increase of any region during 1952. Reliable sources are predicting more than $3 billion worth of contract awards in the southeastern states alone during 1952.

Miscellany: Wisconsin is putting into operation a training program to give young engineers employed by the State Highway Commission a variety of experience during their first 18 months of employment.

The New York State Thruway Bridge across the Hudson between Tarrytown and Nyack will not be built as planned, since bids were higher than the engineer's estimate; it would have been the largest tied-arch span in the world. A less expensive cantilever-type design will be substituted.

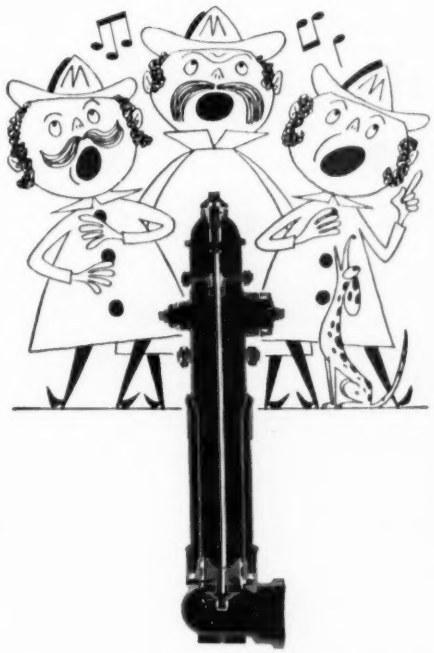
The Oklahoma Turnpike is scheduled to be open to traffic by the time you read this; experience on this road and others may go a long way toward resolving the asphalt vs. portland cement concrete pavement controversy which has popped up on several toll roads.

Has anyone come up with a good scheme for adapting the sufficiency rating system to the use of local units of government? We'd like to know about it if anyone has.

Highway Research Board.—More than 900 persons representing every section of the country and nearly every element of the highway industry attended the 32nd annual meeting of the Highway Research Board in the nation's capital during the spring-like weather of the week immediately preceding the inauguration of President Eisenhower. As usual, it was a well organized, smoothly operated meeting. All credit is due to Fred Burggraf and his staff for their efficient handling of a complex and crowded schedule which included 23 formally scheduled sessions, more than 125 addresses, papers and reports, and innumerable committee meetings and conferences.

This was (and always is) a real working meeting. Committees and administrative groups began work on Sunday with the regular program opening on Tuesday—for 3½ days sessions were held morning, afternoon and night. No social events were included on the schedule, although the traditional cocktail party given by the wonderful people who promote the use of calcium chloride

Installed in Grandfather's Day— Still Providing Full Community Protection



MATHEWS HYDRANTS

Made by R. D. Wood Company

Public Ledger Building, Independence Square
Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

- Mathews Hydrants are built to last. They are so simple and well constructed that there's virtually nothing to go wrong.
- Maintenance is easy, too. Operating thread can be lubricated during spring and fall inspections.
- When the time comes to modernize, it is a simple matter to remove the old barrel and replace it with a modern one. The job is done in a few minutes without digging or breaking the pavement.

No Other Hydrant Offers So Many Essential Features

Compression type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle sections easily raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in removable barrel • A modern barrel makes an old Mathews good as new • Available with mechanical-joint pipe connections

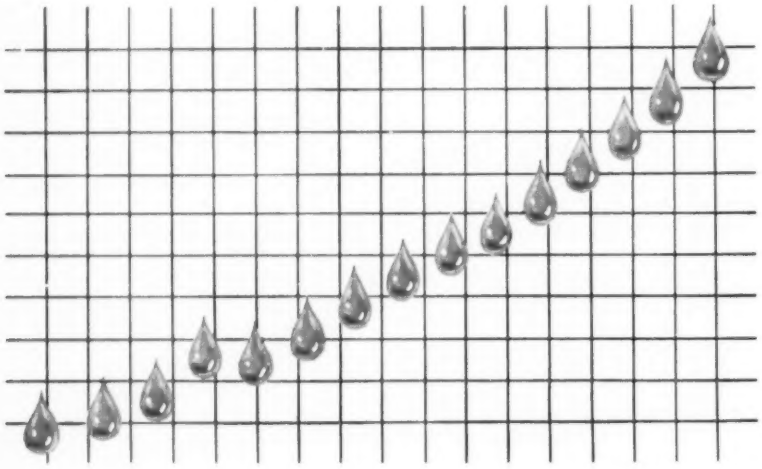
150th anniversary

Need more facts about advertised products? Mail your Reader's Service card now.

provided a break in this vigorous routine.

Subjects which were covered ranged from general discussions of the highway problem to highly technical details of research relating to traffic surveys, roadside development, materials, soils, maintenance, and many other fields. Papers were, in general, of high technical excellence. Ideas exchanged in this meeting lay the groundwork for the improvement of highway practice for many years to come. One of the highlights of the general program was the showing of the color sound film prepared by the Bureau of Public Roads to explain the findings of the Maryland Test Road, about which so much has been written. It is a mighty fine movie, although it may not gross much at the box offices.

For your writer, attending this meeting was like "old home week", since we had not had an opportunity to attend a national meeting in this field in nearly two years. It was a lot of fun renewing old friendships with highway people from all over the country and making new acquaintances.



DROPS . . . that boost sewage handling costs

NEVER UNDERESTIMATE the extra load put on a sewage system by simple infiltration of soil water. Pumping costs jump . . . and disposal plant costs climb likewise.

INFILTRATION can be prevented with ATLAS JC-60,® the new plastic base sewer pipe jointing compound. JC-60 provides tight joints, strong as the pipe itself, that prevent unwanted soil water from entering your pipeline—or sewage from escaping.

Other characteristics of JC-60 provide resistant joints that positively stop root penetration—flexible joints that take normal settling without rupture . . . and numerous on-the-job advantages that speed sewer construction and reduce waste.

GET THE COMPLETE FACTS ON ATLAS JC-60. *Write for Bulletin M20-3.*

ATLAS JOINTING COMPOUNDS

. . . a permanent bond

OTHER ATLAS PIPE JOINTING MATERIALS include GK® and SLIPJOINT GK® for sewers . . . Tegul MINERALEAD® and HYDRORINGS for cast iron water pipe.

ATLAS MINERAL PRODUCTS COMPANY — MERTZTOWN, PENNSYLVANIA — HOUSTON 1, TEXAS

Thousands use our Readers' Service card to keep up to date . . . do you?

Doc Symons

(Continued from page 14)

"Swede" and "Jimmy" (Mrs. Swede) arrived in New York on Oct. 9 from a trip to Africa. Came just in time to say "hello" to a few persons who were saying goodbye to the Federation's 25th Anniv. Meeting.

Next month, I'll start a series of these "Swedefinitions"—And if you have some, send them in.

★ ★ ★

I Read Somewhere — That the University of Chicago Institute of Nuclear Physics was looking for about 30 gallons of water from five to 30 years old.—Wonder if they ever found it?

★ ★ ★

From Doc's Notebook — Just in case you really think Chicago is the "Windy City", the Weather Bureau records show that the average wind velocity there is only 10.8 mph (Max.—87). New York City (Max. —99) and North Head, Wash., both average 14.7 mph; and Buffalo, N. Y. (one of my home towns) averages a close second with 14.5 mph (Max.—70).—Highest average velocity is Mt. Washington, N. H. at 38.3 mph with a maximum of 188 mph!!!

Did you know that you can make your own anemometer by fastening a one foot square board to a spring balance scale. Pressure in psi equal $0.004\ V^2$.—It's as easy as that.

★ ★ ★

Luminous Quote — "You've got to think of everything you say, but not say everything you think." (Overheard, at the theater, by my girl, Va.)

★ ★ ★

Hats Off To—Karl Hoefle, Superintendent of Water at Dallas, Tex.—Not only does his photograph appear on the front cover of this issue of *Public Works Magazine*, but in the February issue of *The Courier* of B-I-F Industries, he has a story about feeding activated carbon slurry in his new Elm Fork Plant.

★ ★ ★

The Joiner — Have discovered another organization in which I carry a card, to wit: "Editors Anonymous," DEE TEE Grade. These cards are distributed at Christmas

and are Ric Johnson's way of saying thanks to contributors to the Percolation and Runoff Column in The *AWWA Jour.*, of which Ric is Editor.

★ ★ ★

News Notes From Brushy Bend — A "Metropolitan Water and Wastes Society" was formed in New York City; Paul de Falco, Jr., of the Interstate San. Comm. is membership chairman.

Myron Tatlock, Dayton, Ohio Cons. Engr., was elected 1953 Chairman of the Southwest District of the Ohio Section of AWWA; Norman Meranda is Secy.-Treas.

The Indianapolis Water Co. "*Water Lines*" is now in its 19th year as a company house organ; John E. Kleinhenz is Editor.

ISAWWA, publication of the Illinois Section, AWWA, edited by C. L. Baylor, reports a Water Works Management Short Course at the Univ. of Ill. in Nov. For speakers, T. R. Larson, Chem., Ill. State Water Survey, obtained famed water works men: L. R. Howson, Chicago Cons. Engr.; "Vic" Weir, Pres., St. Louis County Water Co.; S. C. Casteel, Asst. Supt. East St. Louis Water Co.; John E. Kleinhenz, Publicity Director, Indianapolis Water Co.; and Art. Kuranz, Mgr., Water Utility, Waukesha, Wis. Also on the program were several U. of I. professors in business management, etc.

"*News Leaks*" is the name of a new publication of the Indiana Section of AWWA, edited by Section Secretary George Fassnacht.

"*Sewage Gas*", the Operators Journal, is the quarterly publication of the Indiana Sewage Works Assn.. The Assn. held the annual meeting of its North and South Sections on Dec. 12, in Rice Auditorium of the State Health Dept. Bldg., in Indianapolis.

★ ★ ★

See you in Grand Rapids, I hope.—
V.T.Y.
Doc Symons

● ● ●

Causes of Paint Failure at Richmond-Sunset Plant

Paint failure occurred in the Sedimentation Building of the Richmond-Sunset sewage treatment plant, San Francisco, Calif. Upon laboratory investigation, it was found that the painted surfaces were wet most of the time with a thin film containing about 4 per cent ammonium chloride in solution, with a pH of about 5. The ammoni-

DIRECTORY ▷ Consulting Engineers

ALBRIGHT & FRIEL INC.
Consulting Engineers
Water, Sewage and Industrial Wastes Problems
Airfields, Refuse Incinerators, Dams
Power Plants, Flood Control
Industrial Buildings
City Planning, Reports, Appraisals and Rates
Laboratory
121 SOUTH BROAD ST. PHILADELPHIA 7

ALVORD, BURDICK & HOWSON
Charles B. Burdick Louis R. Howson
Donald M. Maxwell
Engineers
Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation
Civic Opera Building Chicago

MICHAEL BAKER, JR., INC.
THE Baker Engineers
Civil Engineers, Planners, and Surveyors
Airports, Highways, Sewage Disposal Systems, Water Works Design and Operation—City Planning—Municipal Engineering—All types of Surveys
Home Office: Rochester, Pa.
Branch Offices:
Jackson, Miss. Harrisburg, Pa.

BANISTER ENGINEERING CO.
Consulting Engineers
POWER PLANTS, WATERWORKS, CITY PLANNING, RURAL ELECTRIFICATION, SANITATION, WASTE PROBLEMS, AIRPORTS, STREET IMPROVEMENTS
1549 University Ave.
St Paul 4, Minn.

BARKER & WHEELER
Engineers
Water Supply, Sewerage, Sewage Disposal, Power, Public Utility and Industrial Valuations and Rates
36 State Street, Albany 7, N. Y.
11 Park Place, New York City 7

BLACK & VEATCH
Consulting Engineers
Water — Sewage — Electricity — Industry
Reports, Design, Supervision of Construction Investigations, Valuations and Rates
4706 Broadway Kansas City 2, Missouri

CLINTON L. BOGERT ASSOCIATES
Consulting Engineers
Clinton L. Bogert Ivan L. Bogert
J. M. Greig Robert A. Lincoln
Donald M. Dimara Arthur P. Ackerman
Water and Sewage Works
Refuse Disposal Industrial Wastes
Drainage Flood Control
624 Madison Ave., New York 22, N. Y.

BOWE, ALBERTSON & ASSOCIATES
Engineers
Industrial Wastes—Refuse
Reports—Designs—Estimates
Disposal—Municipal Projects
Airfields—Industrial Buildings
Water and Sewage Works
Valuations Laboratory Service
110 William St., New York 38, N. Y.

BROWN ENGINEERING CO
Consulting Engineers
Waterworks, Sewage Disposal, Airports
Street Improvements, Power Plants
Electric Distribution, Rates
K. P. BUILDING DES MOINES, IOWA

BROWN & BLAUVELT
Consulting Engineers
Railroads Water Supply
Highways Sewage Disposal
Bridges Industrial Plants
Airports River Developments
Telephone: Whitehall 4-4797
468 Fourth Ave., New York 16, N. Y.

BUCK, SEIFERT AND JOST
Consulting Engineers
(FORMERLY NICHOLAS S. HILL ASSOCIATES)
Water Supply Sewage Disposal
Hydraulic Developments
Reports, Investigations, Valuations
Rates, Design, Construction, Operation
Management, Chemical and Biological Laboratories
112 East 19th St. New York City

BURGESS & NIPLE
Consulting Engineers
Established 1908
Water supply, treatment and distribution
Sewage and industrial wastes disposal
Investigations, reports, appraisals, rates
Airports, Municipal Engineering, Supervision
584 E. Broad Street Columbus 15, Ohio

BURNS & McDONNELL
Consulting and Designing Engineers
Kansas City 2, Mo. Cleveland 14, Ohio
P. O. Box 7088 1404 E. 9th St.

JAMES M. CAIRD
Assoc. Am. Soc. C. E.
Chemist and Bacteriologist
Water Analysis and Tests of Filter Plants
Office and Laboratory
Cannon Bldg., Broadway & 2nd St.
Troy, N. Y.

CAMP, DRESSER & McKEE
Consulting Engineers
Water Works and Water Treatment
Sewerage and Sewage Treatment
Municipal and Industrial Wastes
Investigations and Reports
Design and Supervision
Research and Development
Flood Control
6 Beacon St. Boston 8, Mass.

CAPITOL ENGINEERING CORP.
Engineers—Constructors
Management
Water Works Sewage Systems
Design and Surveys Roads and Streets
Planning Airports
Bridges Dams
Executive Offices
DILLSBURG, PENNSYLVANIA

THE CHESTER ENGINEERS

Water Supply and Purification
Sewage and Industrial Waste Treatment
Power Plants—Incineration—Gas Systems
Valuations—Rates—Management
Laboratory—City Planning

210 E. Park Way, Pittsburgh 12, Penna.

CHAS. W. COLE & SON

Consulting Engineers

Sewerage, Sewage Treatment, Industrial Wastes, Water Supply, Water Treatment
Airports, Industrial Buildings
Design and Supervision

Chas. W. Cole, Sr. — Chas. W. Cole, Jr.
Ralph J. Bushee — M. J. McErlain

220 W. LaSalle — South Bend, Ind.

CONSOER, TOWNSEND & ASSOCIATES

Water Supply — Sewage — Flood Control & Drainage — Bridges — Express Highways — Paving — Power Plants — Appraisals — Reports —Traffic Studies — Airports
Gas & Electric Transmission Lines

351 East Ohio Street
Chicago 11, Ill.

DE LEUW, CATHER & COMPANY

Consulting Engineers

Public Transit, Traffic and Parking Problems

Railroads — Grade Separations
Major Thoroughfares — Expressways
Subways — Tunnels
Power Plants — Municipal Works

150 North Wacker Drive, Chicago 6, Ill.
79 McAllister St., San Francisco 2, Calif.

A. W. DOW, Inc.

Chemical Engineers

Consulting Paving Engineers
Mem. Am. Inst. Ch. Engrs.
Asphalt Bitumens, Tars, Waterproofing
Paving, Engineering, Materials

801 Second Avenue — New York

GANNETT FLEMING CORDDRY & CARPENTER, Inc.

Engineers

Water Works, Sewage, Industrial Wastes & Garbage Disposal
Roads, Airports, Bridges & Flood Control
Town Planning, Appraisals, Investigations & Reports

Harrisburg, Pa. — Pittsburgh, Pa.
Daytona Beach, Florida

GEORGE A. GIESEKE

Consulting Engineers

Municipal Engineering Problems
Surveying—Housing Development
Water Supply—Industrial Wastes
Sewerage—Refuse Incineration
Design—Supervision of Construction

1405 W. Erie Ave. — Philadelphia 40, Pa.

GILBERT ASSOCIATES, Inc.

Engineers and Consultants

Power Plant Engineering
Water Supply and Purification
Sewage and Industrial Waste Treatment
Chemical Laboratory Service

New York — READING, PA. — Philadelphia
Houston — Washington

GREELEY & HANSEN

Engineers

Water Supply, Water Purification
Sewerage, Sewage Treatment
Flood Control, Drainage, Refuse Disposal

220 S. State Street Chicago 4

HOWARD R. GREEN CO.

Consulting Engineers

DESIGN AND SUPERVISION OF MUNICIPAL DEVELOPMENTS
Water Works and Treatment—Sewers and Sewage Disposal—Investigations and Valuations

208-10 Bever Bldg., Cedar Rapids, Iowa
Established 1913

JOHN J. HARTE CO.

Engineers

Waterworks, Sewerage, Treatment Plants, Gas Systems, Street and Storm Drainage, Improvements
Public Buildings, Airports

ATLANTA, GEORGIA

HAVENS AND EMERSON

W. L. Havens — C. A. Emerson
A. A. Burger — F. C. Tolles — F. W. Jones
W. L. Leach — H. H. Moseley — J. W. Avery

Consulting Engineers

Water, Sewerage, Garbage, Industrial Wastes, Valuations—Laboratories

Leader Bldg., Cleveland 14, O. — Woolworth Bldg., New York 7, N.Y.

HAZEN AND SAWYER

Engineers

Richard Hazen — Alfred W. Sawyer
Water Supply and Sewage Works
Drainage and Flood Control
Reports, Design, Supervision of Construction and Operation
Appraisals and Rates

110 East 42nd Street — New York 17, N.Y.

HILL & HILL

Engineers

Sewage and Waste Disposal.
Water Supply and Filtration.
Dams, Reservoirs, Tunnels.
Airport and Topographic Surveys

Home Office: 8 Gibson St., North East, Pa.

WILLIAM T. HOOPER, JR. CONSULTING ENGINEERS

Water Supply, Sewerage and Sewage Treatment; Municipal, Industrial, and Structural Design; Reports, Supervision, and Laboratory Service

804 Belvidere Street — Waukegan, Illinois

JONES, HENRY & WILLIAMS

(Formerly Jones, Henry & Schoonmaker)

Consulting Sanitary Engineers

Water Works
Sewerage and Treatment
Waste Disposal

Security Bldg. — Toledo 4, Ohio

ROBERT AND COMPANY ASSOCIATES

Architects and Engineers

ATLANTA

WATER SUPPLY • SEWAGE DISPOSAL • INCINERATORS • POWER PLANTS

um salt apparently originated from the sewage flowing through the building. Studies are now under way to determine what other factors may contribute to paint deterioration and what composition of paint will be most effective.

• • •

Red Water Cure

(*Continued from page 63*)

inates pick-up of iron in the distribution system. In Independence, Wisc., the water is treated to reduce the iron to about 0.1 ppm. When pH adjustment of the treated water was discontinued, iron pick-up began. Within six weeks, a sample taken from a 6-inch dead end showed an iron content of 15.1 ppm, resulting in a water that could not be used for laundry purposes and scarcely for drinking.

Red water caused by such corrosion can be controlled by the use of inhibitors, such as sodium hexametaphosphate, but our observations indicate that these substances are not fully effective in dead ends and in areas of small flow, unless these sections are flushed systematically. It is difficult to assure that this is done in many of the smaller communities; therefore, it is better to provide a means for maintaining a safe pH by use of apparatus which will add the lime or sodium hydroxide automatically.

While we have used both lime and sodium hydroxide for pH adjustment, we prefer the latter. Lime must be fed as a slurry and feed lines are subject to clogging. Sodium hydroxide forms a true solution and can be added with a standard liquid feeder; it costs more than lime, but the cost is not excessive. It neutralizes free CO_2 part for part, that is, 1 ppm of N_aOH neutralizes 1 ppm of free CO_2. On that basis, with sodium hydroxide at 6.2 cents per pound, it would cost 0.88 cent per 1,000 gallons for a water containing 17 ppm of CO_2..

Iron Bacteria Growths

While there is a question whether the organism causing these growths are bacteria, there is no question about the problem they create, especially in dead-end sections of distribution systems or in lines where there is but little flow of water. Hydrant flushings from such areas are often red or brown; bacterial examinations usually show the presence of sulphate reducing or iron consuming bacteria. The sulphate reducers convert the sulphates in the water to hydrogen sulphide,

which is converted, in turn, into an acid which attacks iron pipes. This double-barreled action produces red water through corrosion of the iron and also creates a serious taste and odor problem.

Another type of growth, including crenothrix, leptothrix and coccobacilli, seems to require iron already in solution in the water. Though these will cause pitting of iron pipe where they occur in quantity, they do not seem to utilize iron as a food source. However, by concentrating the iron already available, they may cause a red water problem equal in severity to that arising from other causes. Such bacteria are present in most Wisconsin ground waters and will multiply and cause trouble if conditions are favorable to them.

We have used chlorine successfully, either as free chlorine residual or as chloramine. Application may be continuous, using a small dosage; or a very heavy dose may be applied, perhaps once a year for a 24-hour period. It appears that these iron bateria multiply rather slowly and if there are no other causes for red water, such an annual application of chlorine will be sufficient. After the 24-hour chlorine treatment, the system should be thoroughly flushed.

At Rushford, Minn., massive chlorination was recently applied to produce a residual of 25 ppm. The normal iron content before chlorination was 3.3 ppm in the dead ends; after chlorination and flushing it was 0.4 ppm—the same as in the raw water. In this case, partly because of a high CO_2 content, it is believed that the iron in the dead ends will revert to the pre-chlorination normal of 3.3 ppm in perhaps three months. Since the water has a hardness of 330 ppm, a softening plant is being installed, pH will be controlled by feeding caustic soda and a hypochlorite feeder will be used for iron bacteria control by chlorine. Both chlorine and caustic soda will be added to the softener effluent. With the established growths killed by a massive chlorine application, it is believed that a chlorine feed rate of 0.5 ppm at the plant will control future growths.

This article is based on a paper by Mr. Davy before the Wisconsin Section of the American Water Works Association. The original paper appeared in full in the January issue of the Journal of the American Water Works Association. Some additional data and illustrations have been supplied by the author.

Engineering Office of
CLYDE C. KENNEDY
- Water Supply
- Sewage and Waste Treatment
- Sewage Reclamation

CHEMICAL and BIOLOGICAL LABORATORY
SAN FRANCISCO

MORRIS KNOWLES INC.
Engineers
Water Supply and Purification, Sewage and Sewerage Disposal, Industrial Waste, Valuations, Laboratory, City Planning
1312 Park Building, Pittsburgh 22, Pa.

HAROLD M. LEWIS
Consulting Engineer—City Planner
Analyses of urban problems, master plans, zoning, parking, airports, subdivisions, redevelopment. Reports—plans—ordinances
15 Park Row — New York 38, N. Y.

WM. S. LOZIER CO.
Consulting Engineers
Sewerage, Sewage Disposal, Water Supply, Water Purification, Refuse Disposal
10 Gibbs Street — Rochester 4, N. Y.

METCALF & EDDY
Engineers
Water, Sewage, Drainage, Refuse and Industrial Wastes Problems
Airfields — Valuations
Laboratory
Statler Building
Boston 16

BOYD E. PHELPS, INC.
Architects-Engineers
Water Supply and Purification
Sewage & Industrial Waste Treatment
Municipal Buildings
Airfields, Power Plants
Reports & Investigations
Michigan City — Indiana
Indianapolis — Indiana

MALCOLM PIRNIE ENGINEERS
Civil & Sanitary Engineers
Malcolm Pirnie — Ernest W. Whitlock
Robert D. Mitchell — Carl A. Arenander
Malcolm Pirnie, Jr.
Investigations, Reports, Plans
Supervision of Construction and Operations
Appraisals and Rates
25 W. 43rd St. — New York 18, N. Y.

THE PITOMETER COMPANY
Engineers
Water Waste Surveys
Trunk Main Surveys
Water Distribution Studies
Water Measurements and Tests
Water Wheels, Pumps, Meters
New York — 50 Church St.

THE PRELOAD COMPANY INC.
Consulting Engineers
in
Prestressed Bridges, Tanks & Frames.
211 East 37th St., N. Y. 16, N. Y.

RUSSELL AND AXON
Consulting Engineers
Civil—Sanitary—Structural
Industrial—Electrical
Rate Investigations
408 Olive St., St. Louis 2, Mo.
Municipal Airport, Dayton Beach, Fla.

IRBY SEAY COMPANY
Water Engineers—Water Consultants
Water Supply — Water Treatment
Water-use Survey — Water Wastes
516 Goodwyn Inst. Bldg. — Phone 8-2733
Memphis, Tennessee

SMITH & GILLESPIE
Municipal and Consulting Engineers
Water Supply, Water Purification, Sewerage, Sewage Disposal, Drainage
Refuse Disposal, Gas Systems, Power Plants
Airports
Jacksonville — Florida

STANLEY ENGINEERING COMPANY
Consulting Engineers
Airports, Dianlagt
Electric Power—Waterworks
Sewerage—Valuations—Rate Studies
Municipal Buildings
Hershey Building — Muscatine, Ia.

ALDEN E. STILSON & ASSOCIATES
Limited
Consulting Engineers
Water Supply, Sewerage, Waste Disposal, Bridges—Highways—Industrial Buildings
Studies—Surveys—Reports
Surveys, Reports, Appraisals
209 So. High St. — Columbus, Ohio

J. STEPHEN WATKINS
J. S. Watkins — G. R. Watkins
Consulting Engineers
Municipal and Industrial Engineering, Water Supply and Purification, Sewerage and Sewage Treatment, Highways and Structures, Reports, Investigations and Rate Structures.
251 East High Street — Lexington, Kentucky
Branch Office
901 Hoffman Building — Louisville, Kentucky

WHITMAN, REQUARDT and Associates
Engineers — Consultants
Civil—Sanitary—Structural
Mechanical—Electrical
Reports, Plans, Supervision, Appraisals
1301 St. Paul St., Baltimore 2, Md.

PALMER AND BAKER, INC.
CONSULTING ENGINEERS — ARCHITECTS
NAVAL ARCHITECTS — MARINE ENGINEERS
Surveys-Reports-Design-Supervision-Consultation
Transportation and Traffic Problems
Tunnels-Bridges-Highways-Airports-Industrial Buildings
Waterfront and Harbor Structures, Graving and Floating Dry Docks
Vessels, Boats and Floating Equipment
Complete Soils, Materials and Chemical Laboratories
Mobile, Ala. — New Orleans, La. — Houston, Texas — Washington, D. C.

Public Works EQUIPMENT NEWS

Front Dump Shovel Will Handle Large Size Material

The basic front dump shovel unit was designed for underground work where low overhead clearances and maximum dumping heights are required. A similar unit is available for work in quarries and other places where moving large rock pieces is a problem but overhead clearances are not involved. This ⅝-yd. front dump shovel attachment is cable controlled and is designed for mounting on the standard Model L Quickway shovel unit, greatly extending its usefulness for certain conditions. Full data from Quick-Way Truck Shovel Co., Denver, Colo.

New Quick-Way unit

Use coupon on page 28; circle No. 2-1

Vibratory Feeder Handles Up To 500 Pounds an Hour

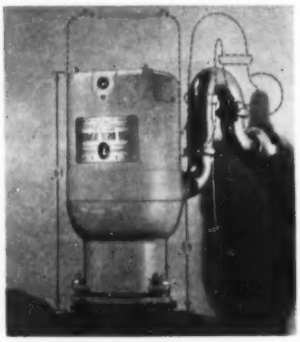
Though this unit is only 7¼ ins. high and 14 ins. long, and weighs only 14 pounds, it will handle up to 500 pounds of bulk material an hour. Control of rate of material flow from the feeder is by a rheostat in the separate controller, and the rate of feed can be regulated from a trickle to maximum capacity. This is the Model F-00. More data from Syntron Co., 660 Lexington Ave., Homer City, Pa.

Use coupon on page 28; circle No. 2-2

"Stubby" Food Waste Disposer Is Easy to Install

Designed to cut installation costs, this home garbage grinder is only 14 ins. high, with the drain opening only 6½ ins. below the bottom of the sink. This permits easy installation to existing drain lines that go through the wall, and often eliminates the need for expensive plumbing alterations. There are other unusual features of this unit. Full information from Mullins Mfg. Corp., Warren, Ohio.

Use coupon on page 28; circle No. 2-3



Easy to install grinder

Sealing Cracks and Joints in Pavements Faster

For placing sealing compounds of the ready-mixed cold-applied types, in joints and cracks in asphalt and concrete pavements, this applicator is easy and fast to handle. A set of three nozzles is furnished—¼-inch for contraction joints; ⅜-inch for construction and contraction joints; and ½-inch for expansion joints. Other sizes are available. More data from Philips Products, Inc., 1442 West 10th St., Cleveland, O.

Use coupon on page 28; circle No. 2-4

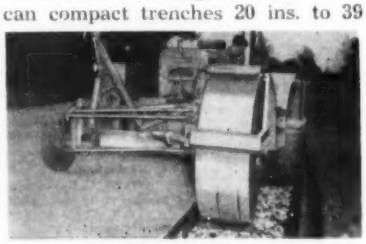
New Small Bucket Elevator Uses Less Space

This is a small and compact bucket elevator for feeding storage hoppers where space is limited. The housing is 9 ins. by 24 ins. and can be constructed to a height of 25 ft. Joints are dust-tight. Drive is by a 1½-hp motor and the maximum delivery is 200 cu. ft. per hour. Dust collectors, bin level switches and other usual accessories are available. Omega Machine Co., 345 Harris Ave., Providence, R. I.

Use coupon on page 28; circle No. 2-5

Trench Roller with Adjustable-Width Rolls

For road widening, this new roller can compact trenches 20 ins. to 39 ins. wide, exerting pressures from 250 pounds per lineal inch (without ballast) to 345 pounds with ballast. The two compression rolls steer independently so they can track for double compression or can be paralleled for extended width rolling. Thus any width from 20 to 39 ins. is compacted in one passage. There are two speeds forward and two reverse, a sprinkling system and scrapers. Both rolls are driven, increasing traction. All Purpose Spreader Co., Elyria, Ohio.



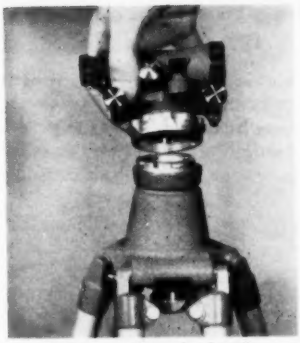
Makes widening easier

Use coupon on page 28; circle No. 2-6

New Engineer's Level is Light and Accurate

The new Kern engineer's level does not use the familiar thumb (or foot) screws, but combines a ball and socket joint with a bulls-eye level to produce leveling that is within one second of true level. The telescope is 4⅝ ins. long; the carrying case is 3 x 5 x 4 ins. The glass has stadia lines for distance readings, with a 1-ft. interval. More from Paul Reinhart Co., Inc., 66 Beaver St., New York 4, N. Y.

Use coupon on page 28; circle No. 2-7



Kern engineer's level

New Ford Tractor is More Powerful and Heavier

The new Ford Tractor, which has hydraulic controls and 3-point linkage for attachments, is more powerful, longer and heavier than previous models. Hydraulic power can be directed instantly to either front or rear-mounted tools, permitting operation of a front-mounted Dearborn loader and rear-mounted tools. Ignition is weather-proofed. The wheelbase has been increased to about 74 ins., overall length to 120 ins. and weight to 2510 pounds. More from Dearborn Motors Corp., Birmingham, Mich.

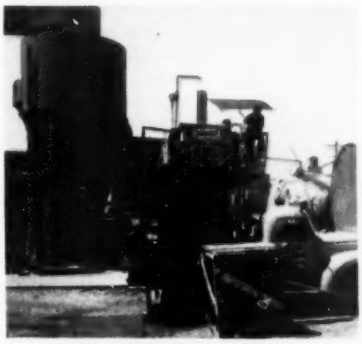
New Ford tractor

Use coupon on page 28; circle No. 2-8

Bituminous Mixer Will Produce Up To 200 Tons per Hour

This is a volumetric type, continuous-mix, bituminous plant which will produce material meeting very strict specifications. Basically, it consists of two parts—a mixer and a gradation control unit. Output is to 200 tons per hour. Accurate controls continually police the quality of the material. The complete plant is highly portable. Iowa Mfg. Co., Cedar Rapids, Iowa.

Use coupon on page 28; circle No. 2-9



New bituminous mixer

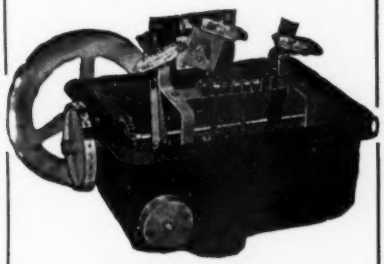
Calculates most anything

Adds, Subtracts, Multiplies, Divides, Etc.

This Curta calculator is claimed to combine the versatility of a large desk calculator with the portability of a slide rule. It adds, subtracts, multiples, divides, cubes and gives square roots. It fits easily in the hand and weighs only 8 ounces. It comes complete with full instructions. To clarify inquiries, the price is $142. More information from Curta Calculator Co., 3851 W. Madison St., Chicago 24, Ill.

Use coupon on page 28; circle No. 2-10

ROTO-TROL



RF-2
with ALTO-TROL

Puts that second pump to work.

A 2-pump RF-2 ROTO-TROL with a built-in ALTO-TROL will operate each pump on alternate starting cycles, assuring equal use and wear of both pumps. Operates both pumps when required.

Depth Indicator optional — extra.

Write for full data.

Water Level Controls Division

HEALY-RUFF Company

791 Hampden Ave., St. Paul 4, Minn.

PLANNED FOR YOUR PROTECTION

CONTINENTAL Chain Link Fence provides better protection features—more value for your fence dollar. You get engineered erection; 12 fence styles; rigid framework secured by tough rods and wire; galvanized fabric, and welded gates. Get these plus features in Continental's "Planned-for-Protection" fence.

*Trade Mrks Reg. U.S. Pat. Off.

CONTINENTAL STEEL CORPORATION
Kokomo, Indiana

Please send FREE copy of "Planned Protection"—complete manual on property protection.

Name_____

Address_____

City_____ State_____

CONTINENTAL STEEL CORPORATION

CLASSIFIED ADVERTISING

ADVERTISEMENTS FOR BIDS

Sealed bids will be received by the City of Key West, Florida, at the City Hall, March 6, 1953, up to 8:00 P.M., Eastern Standard Time, at which time and place all bids will be publicly opened and read aloud. The bids will be based on the furnishing, delivering, installing and/or construction of Sewerage Collection System Improvements, Lift Stations, Force Mains and Ocean Outfall, within the limits of the City of Key West, Florida, and as shown on the Engineer's plans.

Additional information on method of bids can be secured in the offices of Clifford-Cooper & Associates, 101 Westward Drive, Miami Springs, Florida.

CITY OF KEY WEST, FLORIDA

ELGIN Jr. STREET SWEEPER, mdl. F, w/gutter broom, rebuilt, late model, bargain. $1350. Rental apply purchase price GUTTERSNIPE SWEEPER, w/gutter broom, late model, rebuilt. $950 Will rent apply towards purchase price.

Wenzel Machy. Rental & Sales
2136 Jefferson St. Kansas City, Mo.
Phone: Harrison 0021

WANTED TO BUY
CAST IRON PIPE AND FITTINGS
USED OR NEW—SURPLUS
SEND US FULL DETAILS
INDUSTRIAL IRON WORKS
P. O. Box 4625, Portland 2, Oregon

STREET, SEWER AND WATER CASTINGS

Various Styles, Sizes and Weights
Manhole Covers and Steps
Adjustable Curb Inlets
Water Meter Covers
Cistern and Coal Hole Covers
Gutter Crossing Plates
Valve and Lamphole Covers
Write for Catalog and Prices
SOUTH BEND FOUNDRY CO.
Gray Iron and Semi-Steel Castings
SOUTH BEND 23, INDIANA

Three-Wheel Flexible Diesel Driven Road Roller

This is a diesel road roller of radically new design. It has three rolls, which automatically exert maximum pressure on the exact surface point where levelling is required. Despite the fact that this roller operates as a rigid single unit on down-pressure, it is a true 3-section machine with great flexibility of movement. The turning radius is said to be 8 ft. All three rolls follow in the same track, but the center roll can be raised to allow operation as a tandem roller. These rollers are made in 6½ to 8-ton and 10 to 13-ton sizes. All are diesel powered by Cummins, GM or British engines. Ask for Catalog DXRP from Dann Diesel Corp., Empire State Bldg., New York, N. Y.

Use coupon on page 28; circle No. 2-11

★ ★ ★

Chemical Resistant Sewer Jointing Material

A new ductile and chemical resistant sewer pipe joint may be precast on the job, using a hot-poured plastic called JC-60. The molds used are designed so that considerable space remains at the base of the spigot. This space is filled when the line is laid with a new chemical resistant, cold-setting cement called Vibroplast. The resulting joint is ductile as well as resistant to solvents, acids and other corrosives. Full data from Atlas Mineral Products Co., Mertztown, Pa.

Use coupon on page 28; circle No. 2-12

★ ★ ★

Sprayer for Speedy Weed Control Alongside Roadways

By using this low pressure trailer-type sprayer, with 20 to 30 lbs. pressure, danger of damage to adjacent crops is eliminated and the full benefit of the spray material is obtained without fogging or drifting away from the desired area of application. Two trailer sizes are available, with tanks of 135 and 275 gallons. A hose attachment is provided for treating growth that is beyond the reach of the boom. A specification sheet will be sent on request to Gledhill Road Machinery Co., Galion, Ohio.

Use coupon on page 28; circle No. 2-13

★ ★ ★

Electric Chain Saw for One-Man Trimming

Lighter and less bulky than gasoline driven chain saws, this electric driven unit has ample power for trimming, felling and cutting up

HYDRO-TITE

DEPENDABLE JOINTING COMPOUND
Seals Bell and Spigot Water Mains
Economical—Effective
Over 35 Years Of Dependable Performance

HYDRAULIC DEVELOPMENT CORP.
MAIN SALES OFFICE **50 CHURCH ST., N. Y. C.**
General offices and works W. Medford Sta., Boston, Mass.

Get full details of this month's new products . . . mail your Readers' Service card today.

large trees. Special log-gripping teeth hold the saw in place eliminating the need for pushing the saw into the wood. Weight is only 18 pounds. The cutter bar is 14 ins. Power used is 115-volt, 10-amp; but 230 volts may be used. This saw should prove especially valuable in safe work on high timber. More from Porter-Cable Machine Co., 12 Exchange St., Syracuse 8, New York.

Use coupon on page 28; circle No. 2-14

★ ★ ★

New Self-Priming Centrifugals Feature Simplicity

The new line of Humdinger contractors' pumps features simplicity of design, greater efficiency and

capacity, faster priming and more trash handling ability. The only components inside the volute case are the impeller and the seal. Adjustments for impeller wear are made without disassembly of any interior part. Available in 1½" to 10" sizes. Write Ralph B. Carter Co., 209 Atlantic St., Hackensack, N. J., or use the coupon.

Use coupon on page 28; circle No. 2-15

★ ★ ★

Spark-Fired Gas Engines, 265 to 4260 HP

These engines are spark-fired and will run on natural gas, propane, butane, manufactured gas and sewage gas. Other gases of lower btu content can be used but ratings will be reduced. The engines are 4-cycle, with or without supercharging, with ratings of 265 to 4260 hp. They are suitable for pumping service, power plant use, gas utilization at sewage plants and other power installations. Data from Nordberg Mfg. Co., Milwaukee 7, Wisc.

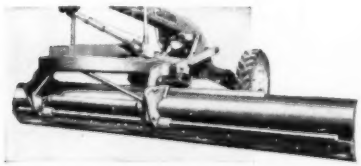
Use coupon on page 28; circle No. 2-16

★ ★ ★

Galion's Newest Motor Grader—The 503

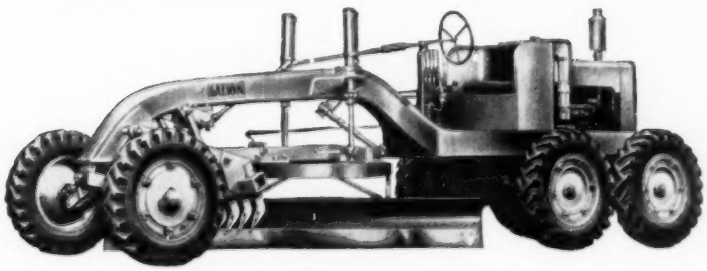
Designed and built like big motor graders, this new unit has many advantages which fit it for a wide field of work. Drive is 4-wheel tandem; engine is 40 hp gasoline; there are four forward and one reverse speeds; weight is 8,720 pounds; and blade pressure is 4,795 pounds. Many big grader type of attachments are available, including the hydraulic shiftable moldboard. The cab is full-size, all steel, with rubber mounted safety glass. Visibility in all directions is unusually good. Leaning front wheels are available as an extra. Other optional extra equipment include snow plow, loader, bulldozer, windrow eliminator, larger tires for both front and rear wheels, and a diesel engine of 36.7 hp. Full data and specifications can be obtained by writing to Galion Iron Works & Mfg. Co., Galion, Ohio, and asking for information on the No. 503 grader.

Use coupon on page 28; circle No. 2-17



Hydraulic Shiftable Moldboard

Removable Cab — Standup height



Features of Galion's New Motor Grader

FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...

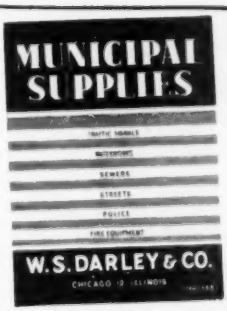
SKINNER-SEAL Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band — at spigot by hard vulcanized gasket tip. 2" to 42".

AND BROKEN MAINS

SKINNER-SEAL Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 800 lbs. line pressure. A lasting repair. 2" to 24" incl.

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA, U.S.A.

MUNICIPAL SUPPLIES



W.S.DARLEY & CO.
CHICAGO 12 ILLINOIS

WRITE TODAY FOR 100 PAGE CATALOG

W. S. DARLEY & CO., Chicago 12

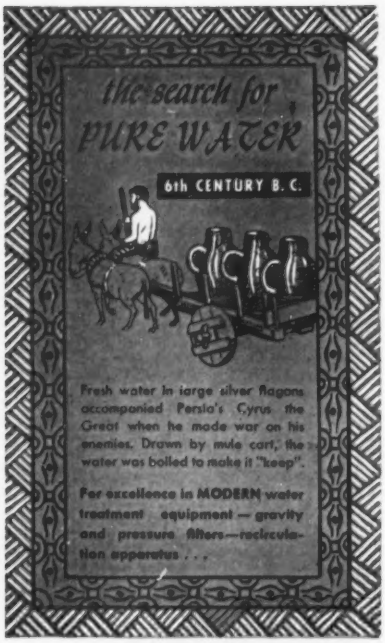
STOP WATER SEEPAGE SEWAGE CORROSION

WITH FORMULA No. 640

a clear liquid penetrating (1"+) sealer for concrete and masonry preventing water absorption and reducing the action of acids. Holds 12' hydrostatic head. Use our Hayproc Rubberized Enamel for color on walls and floors—not affected by concentrated acids, alcohol, oil, or traffic abrasion.

30 OTHER PRODUCTS
Write for technical data.

Haynes Products Co., Omaha 3, Nebr.
See our file in Sweet's


the search for
PURE WATER
6th CENTURY B. C.
Fresh water in large silver flagons accompanied Persia's Cyrus, the Great when he made war on his enemies. Drawn by mule cart, the water was boiled to make it "keep".
For excellence in MODERN water treatment equipment — gravity and pressure filters—recirculation apparatus . . .

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

Roberts Filter Mfg. Co.
640 Columbia Ave.
Darby, Pa.

FIND THAT MISSING VALVE BOX EVERYTIME WITH AQUA!

Locates Surveyor's Stakes, Septic Tanks, Sewer Lids, Etc.

NO BATTERIES! NO WIRES! COMPACT, LIGHTWEIGHT (7 OZ.)

YOUR NAME IN GOLD FREE!

THOUSANDS IN DAILY USE—MOST OF THESE WERE REPEAT ORDERS

SEND NO MONEY!

TRY AQUA FOR 15 DAYS ON YOUR TOUGHEST LOCATION PROBLEM. AQUA is guaranteed to function perfectly through every kind of ground cover. You be the judge!

$29.50 F.O.B. CINCINNATI

Aqua, the ultimate refinement of the dipping needle principle, features convenient shoulder strap, easy-to-read top viewing, air-dampened 35% cobalt alloy steel needle for super accuracy.

Literature on request — address Dept. PW

AQUA SURVEY & INSTRUMENT CO.
2518 LESLIE AVE. . CINCINNATI 12, OHIO

INDEX OF ADVERTISEMENTS

Abrams Aerial Survey Corp. 111
Ace Pipe Cleaning Contractors, Inc. 46
Air Placement Equip. Co. 44
Alabama Pipe Co. 110
Albright & Friel, Inc. 121
Allis-Chalmers Tractor Div. 21
Alvord, Burdick & Howson 121
American Concrete Pressure Pipe Assn. . . . 19
Amman Photogrammetric Engrs., Jack 86
Aqua Survey & Instrument Co. 128
Armco Drainage & Metal Prod. 83
Atlas Mineral Products Corp. 120
Austin-Western Co. 80
Ayer-McCarel-Reagan Clay Co. . . . . 12 & 13

Baker, Jr., Michael 121
Bannister Engineering Co. 121
Barber-Greene Co. 37
Barker & Wheeler 121
Biscayne Terrace Hotel 118
Black & Veatch 121
Blackburn Smith Mfg. Co. 129
Blaw-Knox Co. 55
Blockson Chemical Co. 54
Bogert Assoc., Clinton L. 121
Bowe, Albertson Assoc. 121
Bowerston Shale Co. . . . . 12 & 13
Briggs & Stratton Corp. 33
Brown Co. 35
Brown Engineering Co. 121
Brown, Francis L. 121
Buck, Seifert & Jost 121
Bucyrus-Erie Co. 23
Buffalo Pipe & Foundry Corp. 14
Builders Providence, Inc. 96
Burgess & Nipple 121
Burns & McDonnell Engr. Co. 121
B/W Controller Corp. 38

Caird, James M. 121
Camp, Dresser & McKee 121
Capitol Engineering Corp. 121
Carborundum Co. 47
Carlon Products Corp. 39
Cast Iron Pipe Research Assn. . . . . 8 & 9
Caterpillar Tractor Co. . . . . 4 & 56
Centriline Corp. 40
Champion Corp. 36
Chester Engineers 122
Chicago Pump Co. 3
Clark-Wilcox Co. 36
Classified Ads 126
Climax Engine & Pump Mfg. Co. 113
Clow & Sons, James B., ... 98
Cole & Sons, Chas. W. 122
Combustion-Engrg. Superheater, Inc. 43
Consoer, Townsend & Assoc. 122
Concrete Pipe & Machinery Co. 48
Continental Steel Corp. 125
Corson, Oscar 122

Darley & Co., W. S. 127
Deleuw, Cather & Co. 122
Dempster Brothers, Inc. 27
Dickey Clay Mfg. Co., W. S. . . . . 12 & 13
Dorr Co. 15
Dow, A. W., Inc. 122
Dresser Mfg. Div. 51
Dresser Industries Inc. . . . .
(See Dresser Mfg. Div.)
(See Roots-Connersville Blower Corp.)

Economy Pumps, Inc. 102

Fairbanks-Morse & Co. 31
Federal Enterprises, Inc. 53
Fisher Research Lab., Inc. 112
Flexible Sewer-Rod Equipment Co. 101
Foote Const. Equip. Div. 55
Foster Engr. Corp. 41
Frink Sno-Plows, Inc. 30

Gannett, Fleming Corddry & Carpenter, Inc. 122
Gar Wood Industries 17
Gieseke, George 122
Gilbert Associates, Inc. 122
Gorman Rupp Co. 32
Greeley & Hanson 122
Greenlee Bros. & Co. 94
Green Co., Howard R. 122

Harte Co., John J. 122
Havens & Emerson 122
Hazen & Sawyer 122
Haynes Products Co. 127
Healy-Ruff Co. 125
Hellige Inc. 42

Hill & Hill 122
Hoffco, Inc. 110
Hooper, William T. 122
Hotel Raleigh 118
Hough Co., Frank G. 89
Hydraulic Development Corp. 126
Huber Mfg. Co. 2

Infilco Inc. 105
Industrial Materials Co. . . . . 12 & 13
International Harvester Co. 25
Irving Subway Grating Co. 18

Jaeger Machine Co. 129
Josam Mfg. Co. 44
Johnston Pump Co. 95
Jones, Henry & Williams 123

Kennedy, Clyde C., Co. 123
Kennedy Valve Mfg. Co. 115
Knowles, Inc., Morris 123
Koehring Co. 34

Leopold, F. B. 130
Lewis, Harold M. 123
Link-Belt Co. 10
Lock Joint Pipe Co. 131
Lozier & Co., Wm. S. 123

McConnaughay, K. E. 109
M & H Valve & Fittings Co. 117
McWane Cast Iron Pipe Co. 112
Metcalf & Eddy 123
Morse Bros. Machinery Co. 103
Mueller Co. 49

National Clay Pipe Mfrs., Inc. 87
National Fireproofing Corp. . . . . 12 & 13
National Surety Corp. 26
Natural Rubber Bureau 6
Neenan Foundry Co. 108
Norton Company 20

Oliver Corp. 29

Pacific Flush Tank Co. 112
Pacific States Cast Iron Pipe Co. 112
Palmer & Baker, Inc. 123
Pathfinder Co. 130
Permutit Co. 52
Phelps, Inc., Boyd E. 123
Pirnie Engineers, Malcolm 123
Pitometer Company 123
Pittsburgh-Des Moines Steel Co. 91
Pomona Terra-Cotta Co. . . . . 12 & 13
Preload Co. 123
Price Brothers 85

Quinn Wire & Iron Works 112
"Quick-Way" Truck Shovel Co. 16

Ridge Tool Co. 24
Robert & Co. 122
Roberts Filter Mfg .Co. 128
Rockwell Co., W. S. 99
Roots-Connersville Blower Corp 22
Rotary Concrete Drill Co. 14
Russell & Axon, S. Engrs. 123

Seay Co., Irby 123
Shawnee Mfg. Co., Inc. 42
Skinner Co., M. B. 127
Smith & Gillespie 123
South Bend Foundry Co. 126
Stanley Engineering Co. 123
Stillson Assoc., Alden E. 123

Tarrant Mfg. Co. 99
Texas Vitrified Pipe Co. . . . . 12 & 13
Tilden Tool Co. 48
Trickling Filter Floor Institute . . . . . 12 & 13

U. S. Pipe & Foundry Co. 93

Wallace & Tiernan Co., Inc. . . . . Back Cover
Warrick Co., Chas. F. 34
Watkins, J. Stephen 122
Wheeler, C. H. 102
White Motor Co. 97
Whitman, Requardt & Assoc. 123
Wolverine Tube Division 77
Wood Co., R. D. 119
Worthington Corp. . . . . 11 & 45

PERSONAL NEWS

The Jennings-Lawrence Co., civil and municipal engineers of Columbus 15, Ohio, has reorganized following the recent resignation of R. L. Lawrence. The company name remains the same. The firm now comprises Z. A. Cooke, R. L. Edwards, Dwight Harvey, E. S. Hetrick, L. E. Jackson, A. F. Lohr, R. S. McEwen, Mary E. McKeown, R T. Underwood, C. C. Walker, Jr., T. A. Walker and Claude White, Jr.

JOBS FOR ENGINEERS

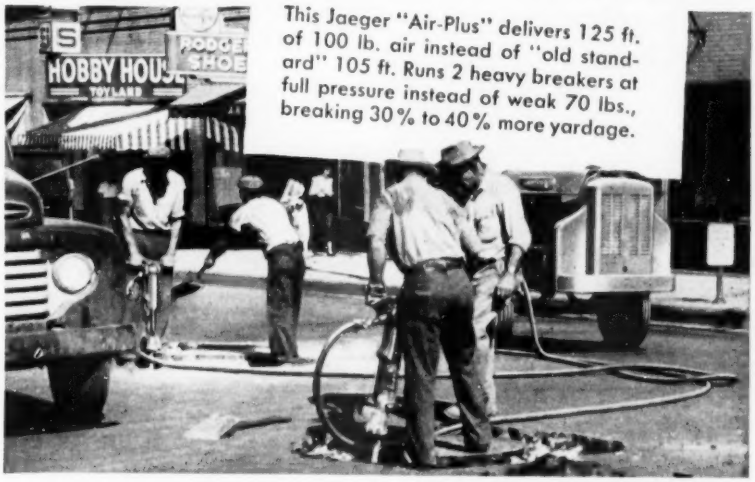
Inquiries on the following will be forwarded but not acknowledged:

PUBLIC WORKS ENGINEER: As Deputy Supt. of Public Works, New York Metropolitan area. Duties will include active operational charge of streets, water, sewer, refuse collection and disposal, parks, and other related public works activities. Engineering degree required; prior municipal or related experience and P.E. license desirable. Excellent career opportunity. Salary $6500 up, dependent on experience and qualifications. Write AR-1, % Editor, PUBLIC WORKS Magazine.

WATER ENGINEER OR MANAGER: In Department of Public Works, New York Metropolitan area. Duties will include full operational charge of water system; 4000 meters, deep well water supply, distribution, construction and maintenance, office and public relations work, plus related sewer system maintenance. Prior waterworks experience essential; engineering degree desirable. Salary $5500 up, dependent on experience and qualifications. Write AR-2, % Editor, PUBLIC WORKS Magazine.

ASSISTANT SUPERVISOR OF SANITARY SEWERS: Civil service position for maintenance of sanitary sewers and installation of new connections. Division has about 130 employees. Requirements include prior supervisory and administrative experience; minimum two years engineering college with hydraulics course; applicant must qualify by civil service examination. Salary $366 to $448 per month; starting grade, based on experience, $373. Write direct to Civil Service Board, City of Dallas, City Hall, Dallas, Texas.

You Can Do 4 Days' Work in 3 with "New Standard" Jaeger Compressors



This Jaeger "Air-Plus" delivers 125 ft. of 100 lb. air instead of "old standard" 105 ft. Runs 2 heavy breakers at full pressure instead of weak 70 lbs., breaking 30% to 40% more yardage.

75 ft. 30% to 40% increases in production are yours with any "new standard"
125 ft. Jaeger from Model 75 that holds full pressure in a heavy pavement breaker
185 ft. up to Model 600 that runs 2 heavy wagon drills at full pressure with air to
250 ft. spare for hand-held drills. Jaeger Compressors deliver this 15% to 25%
365 ft. extra air at lowest cost per cubic foot of air of any compressor.
600 ft.

See your Jaeger distributor or write for Catalog JC-1.

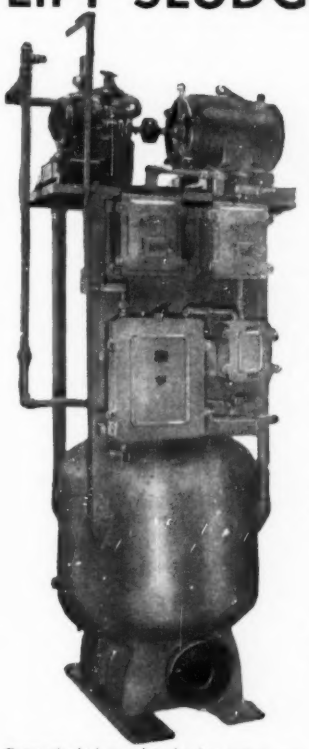
THE JAEGER MACHINE COMPANY 400 Dublin Avenue Columbus 15, Ohio

PUMPS • MIXERS • HOISTS • TRUCK MIXERS • PAVING SPREADERS and FINISHERS

LIFT SLUDGE AND SEWAGE

. . Unfailingly . . With Rugged, Dependable

BLACKBURN-SMITH PNEUMATIC SEWAGE EJECTORS



Compact ejector system having motor compressor assembly and all controls in one "packaged" unit.

Obviate complex piping for air and water. Eliminate clogging of screens, impellers, and shredders.

30 to 500 GPM in both single and twin units against high discharge heads.

Exclusive Modern Features

Over 50 years service has proved the worth of Blackburn-Smith Ejectors. Yet our today's product is full of exclusive modern features such as:

1. Float and electrical float switch controls.
2. Float and pneumatically controlled snap action valve.
3. Electrode controls.

Any one of the above, with or without Air Receivers. Get Catalog S.

REPRESENTATIVES WANTED. ADDRESS:

BLACKBURN-SMITH MFG. CO.

93 River St., Hoboken, N. J.

The practical, economical answer to your underdrain problems

LEOPOLD

Glazed Tile

FILTER BOTTOMS

No corrosion or tuberculation • Practically non-absorbent • Equal filtration, distribution • Low loss of head • Long life • Proved superiority.

Write for details!

F. B. Leopold Co., Inc.
2413 W. Carson Street
Pittsburgh 4, Pa.

YOUR BEST BUY

NEW PATHFINDER PIPE LOCATOR

- ★ POWERFUL PRECISION UNIT
- ★ ECONOMICALLY PRICED
- ★ LIBERAL TRADE-IN PLAN
- ★ BRILLIANT SAFETY PAINT
- ★ LIFE TIME GUARANTEE

Only PATHFINDER offers all vital features you want . . . combined in one handy, compact unit. Quickly, accurately it locates position and depth of pipes, tees, valves, buried tools. The liberal trade-in plan gives you an added opportunity to save. Get the facts and you'll buy PATHFINDER!

Write! State model and year of locator to be traded.

PATHFINDER COMPANY
1726 Beverly Drive • Pasadena 7, California

Worth Telling

by Arthur K. Akers

★ **WORTHINGTON CORPORATION** is now spelled out in big 7-foot letters atop their Harrison, N.J., plant by the Corporation's new electric sign, where he who rides may read. It replaces their former long-name one, and will continue to serve as a beacon for pilots using Newark airport.

Mr. Brown

★ **CARL BROWN** moves up again; this time to sales manager for cast iron pipe with the UNITED STATES PIPE & FOUNDRY COMPANY at Burlington, N.J. Carl is also this year's president of the Water & Sewage Works Manufacturers Association and was former secretary of the Illinois Section, A. W. W. A.

★ **ADD NEW MOVIES:** "Sidewalk Superintendents of America," produced by The THEW SHOVEL COMPANY, Lorain, Ohio; and "Specialty: The Better Way," a BARBER-GREENE COMPANY product. Both are 16 mm. in color and we shall be happy to pass along your requests to show them.

★ **G. F. DeCOURSIN** has been named general sales manager of The FOUR WHEEL DRIVE AUTO COMPANY, Clintonville, Wis. — snow-removal equipment in this field.

★ **VANCE CRAWFORD** sent us a map of the world for a Christmas greeting, showing where he and Mrs. Crawford had been spreading the "Clean Waters" gospel since Vance left active duty with GENERAL ELECTRIC at Schenectady. Captions under the pictures bordering the map indicate that he had learned to write "Merry Christmas" in 20 different languages—no mean feat for an Arkansas boy!

★ **RALPH E. SPEARS** has been appointed district engineer of the Salt Lake City office of the PORTLAND CEMENT ASSOCIATION.

★ **$100 FOR YOUR OLD KITCHEN SINK**—that's the offer of YOUNGSTOWN KITCHENS Division of MULLINS MANUFACTURING COMPANY. All you have to do to be eligible is to trade in for a new Y. K. Jet-Tower electric dishwasher sink before May 2.

★ **AND GAR WOOD INDUSTRIES,** Wayne, Mich., is presenting a desk-size Load-Packer to key city and sanitation officials. Recipients must furnish their own refuse, however, we understand.

★ **EDWARD C. HUERKAMP,** manager of the application engineering department of the WESTINGHOUSE ELECTRIC CORPORATION'S Lighting Division, has been named chairman of the executive committee of the National Street and Traffic Lighting Safety Bureau.

Mr. Clow

★ **A WIDE CIRCLE** of water works men and those in industries serving them will indeed mourn the passing of KENT C. CLOW, 64, president of JAMES B. CLOW & SONS in December. He was the fourth president in the long history of this major company. He also loomed large in Chicago civic affairs. Many will miss him.

★ **ZECHARIAH CHAFEE, JR. and ALAN A. WOOD** were among those recently honored at BUILDERS IRON FOUNDRY, Providence, with 40-year awards. But at Builders if you have been there only forty years you aren't yet dry behind the ears: your life is all ahead of you.

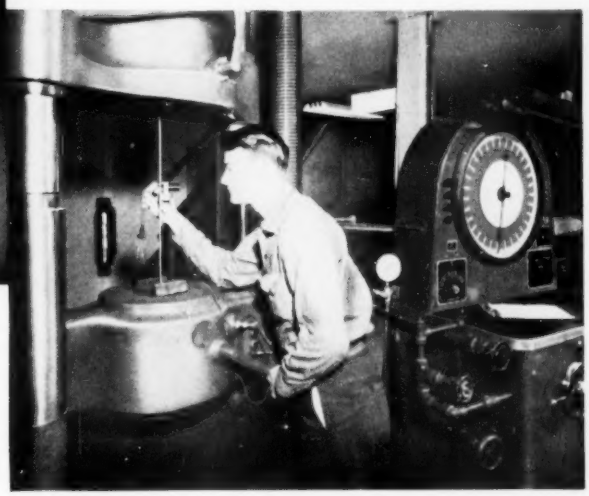
★ **GILBERT HERR** is the new president of MARION (Ohio) METAL PRODUCTS COMPANY.

★ **A FASHIONABLE WEDDING** is defined as one where the father of the bride wears a rose in the muzzle of his shotgun.

. . . a good pipeline

is the sum of good parts . . .

▲ *Testing the compressive strength of a concrete cylinder*



Testing the tensile strength of steel reinforcing wire ▶

The finest design and the most accurate workmanship cannot result in a superior product *unless* the materials used are of the highest quality. That's why Lock Joint assures the excellence of each of its pipes by constantly testing both the finished product *and* the individual materials used.

. . .

In the Company's research and testing laboratory reinforcing steel is tested for tensile strength . . . sand and aggregates are analyzed and classified . . . specimens of concrete in daily use are tested for compressive strength . . . gasket rubber undergoes varied and rigorous tests for elasticity and durability . . . *all* ingredients are definitely proven before they are allowed to be put to use.

. . .

These carefully tested materials, together with Lock Joint's conservative design and precise workmanship, result in a finished product unexcelled in the pressure pipe field. If your project calls for pipe 16″ in diameter or larger, designed for pressures common to water works practice, specify Lock Joint Concrete Pressure Pipe—the pipe that's tested from start to finish and backed by nearly half a century of pipe manufacturing experience.

SCOPE OF SERVICES: *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16″ in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.*

LOCK JOINT PIPE COMPANY

Established 1905

P. O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich., Columbia, S. C.

SEWER & CULVERT PIPE PLANTS:

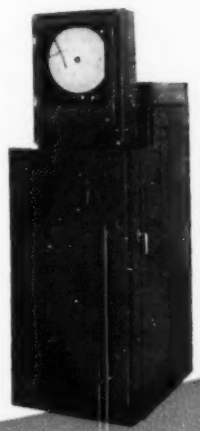
Casper, Wyo. • Cheyenne, Wyo. • Denver, Col. • Kansas City, Mo. Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. • Wichita, Kan. Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. • Oklahoma City, Okla. • Tulsa, Okla. • Beloit, Wis. • Hato Rey, P. R. • Caracas, Venezuela

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

ON CALL TO SERVE YOU

WALLACE & TIERNAN FLUORIDATORS

Wallace & Tiernan is on call to give you the same complete service on fluoridators that it has given on other chemical feed equipment for the past thirty-nine years. When your community is considering the addition of fluorides, W&T Representatives are prepared to provide you with data on the types of chemicals which may be used, the selection of the point of application, the types of equipment available for feeding fluorides, and other aspects of fluoridation. After the decision to fluoridate has been made, W&T can provide accurate, dependable Fluoridators—especially designed for the exacting requirements of fluoridation. W&T's nationwide, factory trained, service staff is prepared to give prompt service on all W&T Fluoridators to ensure the continuous operation of the fluoridation process. W&T is On Call to serve you—see your W&T Representative for additional information.



W&T's Series A-635
Gravimetric Fluoridator

WALLACE & TIERNAN COMPANY, INC.
CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES